Mechanical

AUTOMOTIVE INDUSTRIES

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OCTOBER 16, 1937

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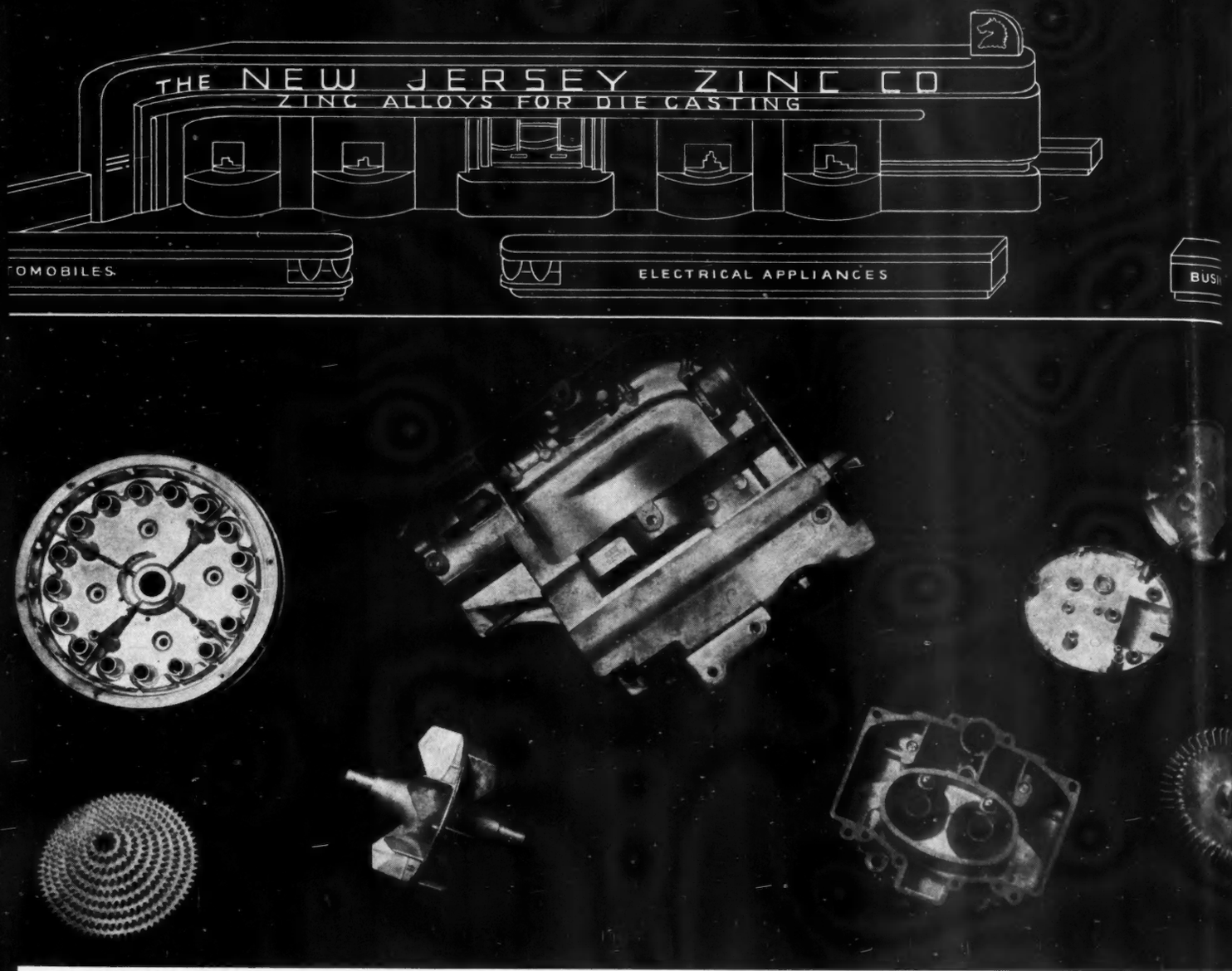

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Published Weekly

Volume 77 Number 16

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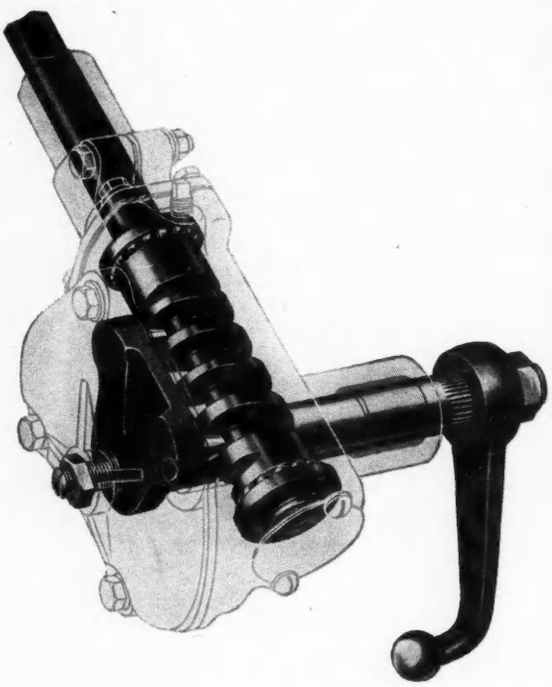

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Published Weekly
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AUTOMOTIVE INDUSTRIES

October 16, 1937
Vol. 77, No. 16

Car Orders Larger Than Year Ago

Factory Officials Make Special Surveys to Determine Current State of Retail Market; Report Business Good

If new model orders now being placed with factories can be considered a gage of the automobile business, the final quarter should produce a very satisfactory volume for the industry. Where announcements have been made, orders are coming in at a faster rate than a year ago. Buick recently reported 65,000 unfilled orders on its books, enough for capacity operations to Jan. 1. To date, Dodge dealers have placed 51 per cent more orders with the factory than a year ago. Packard and Studebaker have more unfilled business on their books than at this time last year.

In view of the stock market slump and the pessimism engendered by it, factory officials have kept in closer touch than usual with their field organizations. One company has just completed a canvass of its distributors by telegram to ascertain the latest pulse of business. The reports were generally to the effect that some hesitancy and apprehension was in evidence "But our business is good." In another instance, a distributor for a recently introduced new line described his business as "swift."

A reappraisal of all the factors affecting automobile sales is being made by one of the major companies and while the study is not completed, the report to date is that there is nothing wrong with fundamentals and that projections for the final quarter still stand.

Business is reported to be very good in the Southwest. It has flattened out a bit in the Southeast but elsewhere throughout the country the automobile business is good. But for labor disturbances on the Pacific Coast, conditions there would be very favorable.

Asked for a candid opinion of the outlook, leading sales executives admitted that the future was made more hazy by the market reaction but said that there was nothing in the current trend of the automobile business to warrant concern. Not enough of the new cars are in dealers' hands as yet for them to explore the retail market but so far they could not sense any resistance to higher prices. First reports from dealers indicate as good or better demand than a year ago and certainly much better than general business sentiment would indicate. But it is too early to make true comparisons with volume a year ago because dealers do not have balanced stocks of cars even where announcements were made a few weeks ago.

Deliveries through September, which were practically all of 1937 models, ran in excess of September, 1936. On the basis of reports to the factories, domestic retail sales last month totaled 261,000 cars and trucks compared with 253,998 units in September last year.

—H. E. G.

Oldsmobile production of 1938 model Six and Eight cars, which started September 9, has now reached a daily total of 825 units, a higher pace for this time of the year than ever before in the history of the company,

(Turn to page 511, please)

This Week

NEWS includes four more descriptions of the new 1938 automobiles . . . price announcements . . . production report with factory figures on output and sales . . . truck announcements including a new Studebaker type, a new Dodge model and the Diamond T cab-over-engine . . . and labor news coverage. As we went to press it was learned that the sitdowns at Bohn Aluminum and Clayton & Lambert reported on page 508 of this issue are ended but that conferences between union and managements are continuing.

FEATURED are Materials Article No. 8 on upholstery fabrics for automobiles covering the three main classifications, flat, pile and coated fabrics . . . and reports on the mechanical details of the Buick, Dodge, Hudson and Nash lines of cars for 1938.

Ford Adds Steel Mills

Rouge to Get $40,000,000 New Facilities

A $40,000,000 Ford Motor Co. plant expansion program involving the creation of increased steel-producing facilities at the Rouge plant has been announced. This follows the 1934-1935 building program which resulted in the construction of hot-strip and cold-finishing mills, enlargement of other facilities and the installation of glass-making equipment.

Policy outlined in the announcement is to enable Ford to maintain, with increasing car production, the production of a substantial share of all the parts required in the manufacture of cars and trucks.

Buildings to be erected will require the purchase by Ford of 45,000 tons of steel. Coincident with the announcement of the building program, a contract was awarded for a new 1000-ton blast furnace, to cost, with auxiliaries, $4,500,000. It will be the first all-welded blast furnace in the world and will complement the two blast furnaces now in use at the Rouge plant.

The expansion program involves, in addition to the blast furnace with the 61 coke ovens now being built and ore storage and handling facilities, a new cast alloy foundry building in which will be made the crankshafts and other parts used in the cars and trucks, conversion of the present electric furnace building to supply the alloys needed, reconstruction of the open hearth furnace facilities and reorganization of manufacturing methods to be done under a progressive schedule permitting operation of a majority of furnaces at one time, an addition to the open hearth building to house a new Bessemer converter, installation of new equipment in the steel finishing mills and addition of a third 110,000 kw. turbo-generator. New gas storage tanks are being built.

The steel finishing mills will be equipped to roll 60-in. sheet against the present 48-in. sheet.

AFL Assails NLRB

The American Federation of Labor, at its annual convention in Denver, Oct. 13, adopted a resolution charging the National Labor Relations Board with bias in favor of the CIO, with attempting to destroy valid labor contracts and with other actions for which it was not given authority by the Wagner Act. The resolution also directed the president of the union to urge President Roosevelt to take steps looking toward a correction of the situation.

See No New General Wage Rise

Detroit Feels That Only Adjustments Will Be Made; Signs Point to More Amicable Labor Relations

With wage rates of automobile workers at the highest level in history, both car and parts manufacturers are hopeful of going through the 1938 production season without major labor disturbances. The feeling among employers seems to be that wages have about reached a ceiling and that companies now paying top rates are not likely to go higher. Those who have lagged behind probably will be forced into line which will step up the average for the industry, but the range of the wage scale is expected to remain about the same.

It is notable that where contracts have been renewed, the hiring-in rate of 65 cents an hour and the minimum of 75 cents, paid after the probationary period, have remained undisturbed. Only adjustments were made in the higher brackets. Observers feel that during the coming year the union will be satisfied to iron out inequalities and to bring the general level up to the top rates now in effect for the various classifications. Where wages are out of line, the union undoubtedly will put up a fight and sporadic outbreaks may be looked for throughout the industry. But it is not expected that pressure will be brought to bear on companies now paying maximum rates, and in these cases new demands will be concerned chiefly with hours and working conditions.

Straws

"The heat has been taken out of the labor situation" was the way one of the leading car manufacturers described current conditions. Both sides have learned much from last year's experience and are much less militant in their attitude toward each other. There is, of course, the languishing Ford campaign of the UAW to be considered. But just now the union is absorbed in Detroit politics and in setting its own house in order. The UAW is waging a strenuous campaign to elect its candidate for mayor and five union candidates for positions on the city council. At the same time president Homer Martin is contending with rebel groups in the organization who are protesting his recent "purge" of radical organizers.

Employers, in recent negotiations, have sensed a more reasonable attitude on the part of labor leaders. Two incidents may be cited as hopeful signs in the industrial relations picture. An employe of a major parts company, who had been somewhat of an agitator, attempted to start a sitdown strike to protest the speed of production, but failed to get the support he expected from fellow workers. The troublemaker was suspended by the foreman and given a hearing before the union shop committee which gave him the alternative of going back to work under conditions as they were or being discharged. The man was finally dismissed with sanction of the shop committee. At another parts company, a group of workers are striking for overtime rates on certain work. The management has refused to grant the demand and is being supported in its position by union officials.

Uniform Contract?

For the most part, wage rates of leading manufacturers in the principal automotive centers of Michigan are fairly close together. But some companies still complain of advantages held by competitors. These inequalities, however, are not expected to remain very long. The UAW recently addressed letters to a group of competing manufacturers in the parts field asking them to negotiate a uniform contract. It would be signed individually by the various companies, but the contract in each case would be identical. The negotiations are still in progress, and if satisfactory, may establish a new policy.

The materially improved status of the automotive worker is shown in a study made by the Automotive Parts and Equipment Manufacturers, Inc. Employment data from 48 original equipment parts plants compiled for the 40 weeks ended August 21 last and compared with corresponding period a year earlier showed that each factory worker, male and female, worked an average of 1.2 hours less per week; got 10.8 cents more per hour; and increased

(Turn to page 505, please)

AFL Refuses CIO Bid To Joint Parley

Continuance for the time being at least of the basic split between the two wings of the American labor "movement" appeared certain on Oct. 12 when William Green, president of the American Federation of Labor, rejected a bid by the CIO to a joint parley at which unification would be discussed. The CIO invitation, unanimously approved at a meeting at Atlantic City, N. J., was conveyed to the AFL convention in Denver, Colo., by Harvey Fremming, president of the United Oil Workers, CIO affiliate. The suggestion called for committees of 100 from each organization to meet at a mutually acceptable time. John L. Lewis, CIO head, who endorsed the proposal as a "statesmanlike offer" when it was framed, would make no comment when the Green refusal was made known. The AFL head criticized the offers of the CIO on the grounds of "insincerity."

More "Wild Cats"

Fisher Body Dispute Ended After Several Days

Despite the apparently good intentions of its international officers, the United Automobile Workers union still lacks complete control of its members, it was demonstrated in Detroit during the past week when two unauthorized strikes broke out.

(Turn to page 508, please)

MEN OF THE INDUSTRY

H. I. HAZZARD has been appointed chief engineer of the American Bantam Car Co., and

A. C. OLANDER sales manager. Mr. Hazzard was with the Lycoming Mfg. Co., passenger car division, and Mr. Olander was with the Studebaker Sales Corp.

GEN. OTTO H. FALK, chairman of the board of the Allis-Chalmers Mfg. Co., Milwaukee, has been selected as the 1937 candidate for the distinguished service medal of the Milwaukee Cosmopolitan Club for "meritorious services to his community and general philanthropic enterprises."

PAUL B. MEANS, formerly manager of battery and spark plug sales for the Firestone Tire & Rubber Co., and more recently with Goodrich, has joined the Seiberling Rubber Co. of Akron as head of a new dealer accessory department.

M. J. GRAHAM, former superintendent of International Harvester Company's West Pullman, Ill., works in Chicago, has been named superintendent of the new $4,000,000 works nearing completion in Indianapolis, Ind.

FRANK N. MORGAN has been appointed to the newly created post of assistant to the president, Reo Motor Car Co.

C. R. EVANS, former industrial relations manager of the company's works at East Moline, Ill., will be industrial relations manager at the Indianapolis unit. Mr. Graham joined the company in 1905 as an office boy. He was superintendent at West Pullman since 1927. Mr. Evans joined the company in 1920 as a clerk in the industrial relations department.

C. F. WATSON has been appointed director of sales, truck division, Studebaker Corp. **W. E. CONWAY** continues as assistant director of truck sales.

H. SIDNEY SMITH, consulting engineer for Union Carbide & Carbon Corp., has been awarded the Samuel Wyle Miller medal for meritorius contribution to the art and science of welding.

M. F. MAY has been appointed vice-president of the Young Radiator Co., Racine, Wis., it was announced by F. M. Young, president. Mr. May has been associated with the company since 1930.

JAMES J. ST. CROIX has moved his headquarters to New York, where he is associated with the firm of Howard Ketcham, Inc. Mr. St. Croix has had much to do with the design of bodies for automobiles, buses and special vehicles.

Buicks for 1938

COIL SPRINGS at the rear are provided on all four series. The series 80 and 90 cars are two inches longer. Styling is new, marked by a new radiator grille which is more upright than before. Bodies are mounted in a new manner in an effort to reduce vibration and noise.

Buick is announcing four lines for 1938 with a number of changes in both bodies and mechanical arrangements. The four are the series 40, 60, 80 and 90, the two latter lengthened 2 in. each to 133 in. and 140 in., respectively.

Bodies on the series 40 and 60 have been altered in appearance through the use of new radiator grilles, the profile of which is straight up and down instead of raked rearward, and through new trim. Bodies on the series 80 and 90 have been redesigned to conform to the styling of the 40 and 60, and are 2 in. wider than before. There is some wood used in the construction of the series 80 and 90 bodies, but other bodies are all steel.

Mechanically, there are several major changes. All models employ coil springs at the rear but all retain torque tube drive with a rigid axle so that the suspension is not independent at the rear. Hypoid final drive gears are used in all models, permitting floors to be low without humps. Independent front end suspension with coil springs is retained.

A new form of domed piston head is used in all engines permitting a higher compression ratio.

All bodies are mounted in a new manner, using a considerable amount of rubber to insulate them as completely as possible from the frame.

On the series 40 alone there will be supplied as an option the automatic transmission, manufacturing details of which were described in the Sept. 11 issue of AUTOMOTIVE INDUSTRIES.

Other changes include fixed hood sides with hinged lids, providing access to ordinary service operations while at the same time stiffening the front end sufficiently to permit elimination of radiator braces. At the rear, the license plate bracket, light and rear panel locking handle have been incorporated into one unit. The gasoline tank filler is reached through a trap door in the rear fender. Battery is the new long, narrow unit and is mounted on the hood ledge with provision for air cooling.

Interior trim has been redesigned with particular emphasis placed on the reduction of projections into the driver's compartment, accomplished through recessing the center portion of the instrument panel on which are mounted several control knobs.

Mechanical details of the new Buicks will be found on page 520 of this issue.

Dodge, Chrysler Prices Higher

Dodge division of Chrysler Corp. has announced prices on the 1938 cars which were described in AUTOMOTIVE INDUSTRIES, issue of Oct. 9. These are the first prices for a Chrysler product to be announced and show increases over the 1937 prices. Chrysler Corp. did not advance prices in August as did the balance of the industry, so that the schedule now published represents the full extent of the increase over prices which obtained for the past full model year.

Following are the 1938 Dodge factory delivered prices compared with those on like models for 1937 models:

	1938 Prices	1937 Prices
Business coupe	$808	$715
Coupe, rumble seat	858	770
Convertible coupe	*	910
Sedan, 2d	858	780
Touring sedan, 2d	870	790
Sedan, 4d	898	820
Touring sedan, 4d	910	830
Sedan, 7p, 132 in. wb.	*	1075
Convertible sedan	*	1230
Limousine, 132 in. wb.	*	1175

* Not yet available.

Following are delivered prices at Detroit including everything but local taxes and freight charges for the Chrysler Royal and Chrysler Imperial:

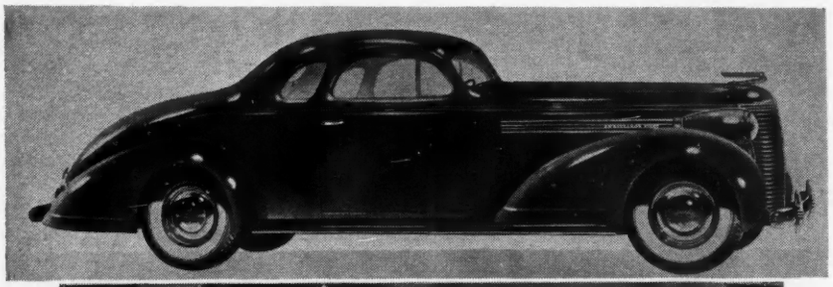
Royal	1938 Prices	1937 Prices
Coupe	$918	$810
Coupe, rumble seat	963	860
Brougham	963	870
Touring brougham	975	880
Sedan	998	910
Touring sedan	1010	920
Imperial		
Coupe	1123	1030
Coupe, rumble seat	1160	1070
Touring brougham	1165	1070
Touring sedan	1198	1100

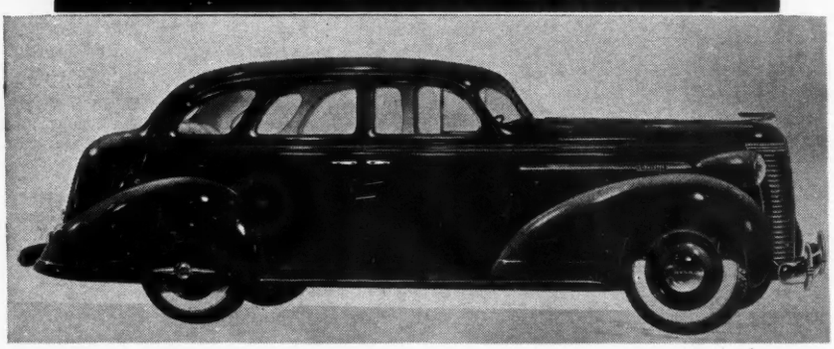
Prices for convertibles and Custom Imperial models will be announced later.

Metallic Colors

Metallic colors for automobiles have become so popular during the past year and the demand for them has become so great that they will dominate the 1938 models to be shown at the New York show, according to Elizabeth French, director of the Duco Color Advisory Service, who is closely in touch with manufacturers in the selection of finishes to be used during the forthcoming year.

In general the new models will appear in lighter and clearer colors, she says.





NASH PRODUCTS for 1938 have, as optional equipment, a new winter air conditioning system and a vacuum-operated gear shift. At the top is shown a Nash Ambassador 8 coupe, in the center is the new, dual-colored radiator grille common to all lines, and at the bottom is the Nash LaFayette sedan. There is more room in the carefully-insulated bodies of all models.

"Nationalize" Paris Show?

A bill has been introduced in the French Chamber of Deputies by Emile Périn of Nièvre which provides for the "nationalization" of the Paris "Salon de l'Automobile." Under the plan proposed, the show would be controlled by a government committee.

Up till now the show has been under the control of a committee on which seven industrial organizations are represented, four of which are directly interested in the event. These latter comprise the Automobile Manufacturers Association, the National Association of the Cycle and Motorcycle Industry, the Association of Manufacturers of Accessories and Original-Equipment Parts, and the Body Builders Association of Paris and the Departments. The three others are the Association of Farm Tractor Manufacturers, the Aircraft Manufacturers Association, and the National Association of Automobile Dealers. All of these participate in the profits of the show. There is also an Association of Manufacturers and Wholesalers of Replacement Parts, which has been trying to obtain representation on the organizing committee, and thereby for its members the right to exhibit at the show, and there are indications that it will press its claims now that the matter of the control of the show has been brought to public attention by the introduction of the "nationalization" bill.

Pump Concerns Merge

Hayes Equipment Mfg. Co. and the Clear Vision Co. have been combined under one management and the already-financed merger has begun operations. The company manufactures service station pumps.

Announce Nash Series

Several New Developments Included in Design

Nash is announcing three new series for 1938 including the Nash Ambassador Six and Eight lines, and the Nash-LaFayette line. The latter is available in Deluxe and Master styles.

A number of features are built into the line, chief of which are the winter air-conditioning system, a vacuum operated gear shift, both optional equipment, and engines with intake and exhaust manifolds cast in the block. Bodies are newly styled and are longer, wider and lower, with special attention given to sound-proofing.

The air-conditioning system consists of a unit containing an air filter, fan and hot water heating element. Air is taken in through the cowl ventilator, cleaned and warmed. During wet weather most of the moisture in the air is "spun" out by an arrangement in the intake duct and carried off by a vent pipe provided for the purpose. The system builds up air pressure slightly greater than atmospheric inside the car, preventing ingress of cold air from outside and resulting in ejection of stale air.

The new Nash engines utilize the same principles of construction that have been employed on the LaFayette line for three years, casting of the manifolds in the block making possible elimination of a large number of parts. The gear shifting device is vacuum operated and is controlled by a short lever mounted on the instrument panel.

Radiator grilles of all three lines of cars are identical in design and are made up of horizontal fins that conceal the radiator core. Faired-in headlights are mounted on hood side panels. Engines have been moved forward three inches and hoods are four inches longer, altered arrangements in the bodies, however, providing 2½ inches extra room in the front compartment and two inches more in the rear compartment. A new method of body mounting makes possible the lowering of the rear end by one inch, but does not affect road clearance or interior measurement from floor to roof.

Rubber seals are used at various points to keep out moisture and dirt as well as to aid in the drive for silent operation. Seats are built on steel frames. Mechanical details of the cars will be found on page 526 of this issue.

Trailer Taxes

Trailer inhabitants are now taxed in 24 cities, according to a survey by the American Municipal Association. Fifty-three cities answered the association's queries; of these 29 do not impose any tax on trailers. Of the 24 levying taxes, only one directly taxes the individual trailer owner, the others taxing camp operators. The exception is Peoria Heights, Ill., 3,200 population, which levies a direct annual tax of $50 for each trailer. Annual license fees charged camp operators of 30 units range from $4.80 in Phoenix, Ariz., to $225 in Virginia Beach, Va.

Hudson and Hudson Terraplane for 1938

LENGTH is a major characteristic of the appearance of the Hudson Terraplane for 1938, a brougham model of which is shown above. The wheelbase is 117 in.

FRONT end view of the Hudson eight Victoria coupe on a 122-in. wheelbase, showing details of radiator grille and trim. Above is the rear end design of the Hudson six and eight cars. Tail lamps are mounted high on the fenders.

New Hudson and Hudson Terraplane automobiles for 1938 include a Hudson eight on two wheelbases, 129 in. and 122 in., a Hudson six on a 122 in. wheelbase and the Hudson Terraplane on a 117 in. wheelbase.

A considerable number of body refinements are incorporated in the new lines. There is a new radiator grille treatment giving a more rounded appearance to the front end of the car, and new trim on the exteriors. In the body interiors two-tone upholstery is employed, while garnish moldings are entirely new, some of them chromium.

All rear compartments have been increased two inches in length as the result of redesign of the front compartment, which retains the same dimensions as before. The instrument panel has been moved two inches forward, permitting the placement of the front seat that much nearer the windshield and improving driving vision. The instrument panels themselves are new. The use of tell-tale lights to show the engine oil pressure and the generator charging rate is continued.

The selective automatic shift transmission has been improved for smoothness in operation and is retained as an optional feature. Operating economy is said to have been increased through carburetor and throttle changes. The ignition system is fully shielded from moisture and changes have been made which are said to lengthen spark plug life. Muffler changes have been made with the objective of reducing body heat and noise.

Rear tread has been increased 1½ in. on all models to permit the use of oversize tires without any interference between tire and wheel housing. New disk wheels are standard.

Mechanical details of the new Hudson and Hudson Terraplane lines will be found on page 528 of this issue.

Studebaker Delivery Unit

Studebaker Corp., truck division, has announced a new "Fast Transport" model which is in the ¾ to one-ton range. It is described as the companion model to the 1000-lb. capacity "Coupe-Express" introduced earlier this year.

The new model has a truck-type kick-up frame and two-stage underslung rear springs with 16-in. wheels. Engine has six cylinders of 3 5/16 in. bore by 4⅜ in. stroke, making a piston displacement of 226 cu. in. It is rated at 79 hp. Transmission has three speeds with a silent second gear while the clutch is of truck type of 10 in. diameter. Features making for driver comfort are adjustable seat back, controlled ventilation, built-in defrosters, sun visor, dome light, twin windshield wipers, ash tray and dash compartment with lock.

Agency Appointed

The Van Auken-Ragland, Inc., advertising agency of Chicago has been appointed to direct the advertising of the Ramsey Accessories Mfg. Corp. of St. Louis, Mo., makers of Ramco piston rings. National magazines, business papers and direct mail will be used.

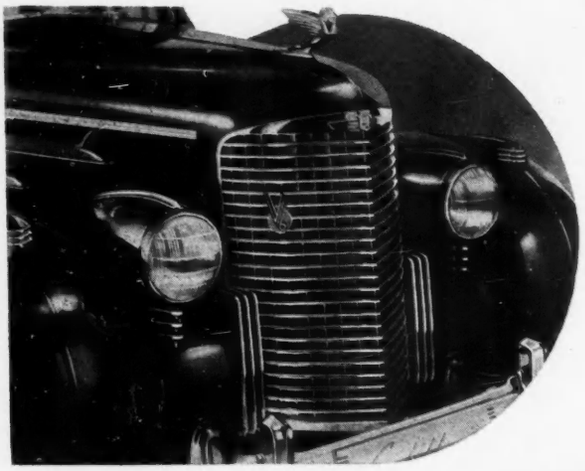
Hudson Prices Given

Prices of Hudson cars for 1938 will show only minor changes with increases of less than 2 per cent on the volume models and reductions on some of the higher priced group due to a realignment of the accessory policy. The new prices announced by William R. Tracy, vice-president in charge of sales of the Hudson Motor Car Co., begin at $796 on the Hudson Terraplane, $909 on the Hudson Six and $990 on the Hudson Eight.

"These are actual delivered prices in Detroit, except for the state sales tax," states Mr. Tracy. "The prices include safety glass all around as well as all essential and many deluxe accessories. The range of increase is from $13 to $27 on Hudson Terraplanes, Hudson sixes and Hudson eights with closed bodies. Increases on the sports type convertibles are somewhat greater. On the custom eights the reductions range up to $11 due to changes in our policies on equipment."

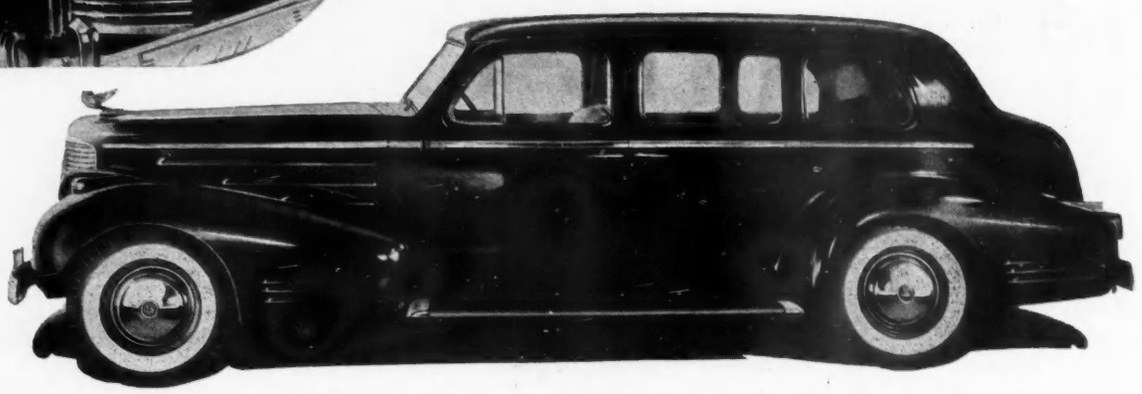
Ford Closes at Kansas City

Due to labor troubles, the Kansas City branch of the Ford Motor Co. will not resume operations on 1938 cars, Harry Bennett, Ford personnel chief, told AUTOMOTIVE INDUSTRIES. "We don't need the plant and if I have my way about it, it will never reopen," he said. Bennett complained of lack of police protection and commented that the branch manager was advised by a local policeman to get a pass from the union to get into the plant.



Cadillac V-16 for 1938

NEW ENGINE is the major feature of the Cadillac V-16 for 1938. The engine is quite "flat," with cylinder banks set at an angle of 135 deg. Wheelbase of the car is now 141 in. Styling is entirely new, featuring a large die-cast grille at the front end and redesigned all steel bodies. Another development is the use of a gear shifting lever mounted just under the steering wheel.



Major changes have been made in the Cadillac V-16 line for 1938. Foremost among these is the introduction of a 185-hp. engine with cylinder banks at an angle of 135 deg. or almost opposed to each other. The standard wheelbase is 141 in., as compared with 154 in. last year. Special efforts have been made to eliminate vibration and to assure silence in operation.

The front end of the car has been completely redesigned and now comprises a one-piece, die-cast radiator grille of large dimensions. Grille and trim are bright-finished. Bodies are of all-steel construction, and the sheet-metal treatment is new. In the seven-passenger cars there are auxiliary seats of a new design which reduces the thickness of the seat backs and provides additional room in the rear compartment when the seats are in use. These auxiliary seats fold flush into the backs of the front seat. Bodies are wider and longer than those of the previous model.

Gear shifting now is by a lever mounted on a bracket under the steering wheel. The transmission is still hand-controlled and only the position of the shift lever has been changed. As regards the shifting procedure, only the direction of movement is different from that with the standardized shift. For example, to shift into low, the lever is moved up and backward instead of to the left and backward as before.

Hypoid rear axles are used. A newly designed frame is said to be 100 per cent stiffer than the older type. The road clearance has not been reduced, in spite of the fact that the bodies are lower, this having been made possible by placing the mufflers transversely at the rear of the fuel tank.

Engine and clutch weigh only 1000 lb., considerably less than the previous model. The engine is supported on five rubber mountings similar to those used on the V-8.

Camera Studies Road Width

The average motor vehicle driver wants plenty of clearance in passing other vehicles and there are few drivers that barely clear the passed vehicle, reports a candid cameraman of the Bureau of Public Roads who trailed motorists and made a motion picture record of their actions in passing other vehicles. The purpose was to throw more light on the width of highway necessary for the safety and convenience of modern traffic.

The camera was mounted upon a bracket just outside the driver's window; and a mechanical arrangement enabled him to operate it while driving. The pictures were later studied to determine what positions motor vehicles take on the road when passing other vehicles and when being passed.

The observers placed their car in free traffic, selected a vehicle and followed 200 to 300 ft. behind it, near enough to get good pictures but far enough to encourage a third vehicle to pull in between. Just as the middle vehicle pulled out to go around the leading one, the camera was started and the entire passing maneuver was photographed. The observers drove at the same speed as the vehicle being followed, and the speed was recorded. In addition, the place of passing was marked for examination and measurement of road conditions.

In this way, the observers could study the positions on the pavement of all kinds of vehicles passing in the same and opposite directions. Examples were taken on two-lane highways of 18, 20 and 22-foot widths, surfaced with portland cement concrete or bituminous concrete.

Both cars and trucks follow the centerlines of traffic lanes closely when being passed. The average clearance of passenger cars overtaking and passing other passenger cars ranges from 3.8 ft. on 18-ft. surfaces to 4.9 ft. on 22-ft. surfaces. For opposite-direction passing the range is from 4.0 ft. to 5.7 ft.

Speed has an effect on the car's position on the pavement. As the speed increases, drivers tend to travel farther away from the right edge of the road. A car passing another car going in the same direction requires more road width than one passing from the opposite direction, for it must travel faster than the car in front. On pavements only 18 ft. wide, the left wheels of the passing vehicle are often driven on the shoulder.

In general, it was found that roads 18 ft. wide are too narrow either for passenger cars alone or for mixed traffic; that pavements 20 ft. wide are inadequate for dense traffic involving trucks, but are reasonably satisfactory for the more lightly traveled roads with few trucks; and that a road width of 22 ft. in entirely adequate, safe, and comfortable for modern mixed traffic.

Air Traffic Rises

Scheduled airlines in this country carried 123,550 passengers and 618,113 lb. of express in August against 120,571 passengers and 611,562 lb. of express in July, the Department of Commerce announced. In August, 1936 the passengers numbered 106,543 and the express amounted to 565,358 lb.

No General Wage Rise

(Continued from page 500)

the weekly pay check $3.07 to $28.97 for the shorter week. Average hourly rate of pay went from 67.6 cents per hour in 1936 to 78.4 cents in 1937, and compares with an average rate of 59.8 cents paid in 1934. During the 1937 40-week period, each productive factory employe worked 48 hours less than in 1936, but earned $122.80 more.

On a percentage basis, the average hourly rate of pay for all employes, male and female, was up 16.3 per cent and weekly earnings 11.9 per cent. There were 21.9 per cent more workers employed. Man-hours increased 17.6 per cent and total payroll of the plants was up 35.9 per cent. The average number of employes working in the 48 plants rose to 82,963 in 1937 from 68,085 in 1936, and total payroll disbursed increased to $99,389,000 from $73,130,000.

Although the greater part of the increased labor cost is being passed on to the ultimate consumer, both the supplier and the car maker complain of having to absorb some of the increase. Parts makers report that prices in their 1938 contracts with the car manufacturers cover the major portion of the wage boost. The car makers in turn are putting higher price tags on their finished product, but insist that their increased costs are not entirely covered. Perhaps the element for which allowance cannot be made and by which no one is the gainer, is the loss in efficiency of workers under union domination, due to being on day rates instead of on a piece work basis as generally prevailed in the past. Some plants estimate that their efficiency has dropped as much as 20 per cent.

GM Sales Gain in Month

September Over 1936 Period: Price Rise Seen Factor

Sales of General Motors cars showed sharp gains in September over September, 1936, in all three classes reported by the company., sales to domestic consumers, to domestic dealers and to dealers in the United States and Canada together with overseas sales. Seasonally, sales dropped from August. The combination of August and September reports probably reflects the price increases made effective during August as August sales fell less from July than last year and September volume held up in anticipation of higher prices for 1938 models.

Details of the sales report were as follows:

	September 1937	August 1937	September 1936	11 Months of Model Year 1937	11 Months of Model Year 1936
Sales to domestic dealers	58,181	157,000	4,669	1,635,344	1,558,013
Sales to domestic consumers	88,564	156,322	85,201	1,608,954	1,605,972
Change in dealer stocks	−30,383	+678	−80,532	+26,390	−47,959
Sales to foreign dealers	24,136	31,010	14,619	389,868	326,531
Sales to world dealers	82,317	188,010	19,288	2,025,212	1,884,544

NEW VERSION of tractor-trailer streamlining is provided in this Mack model. There is a special wing arrangement between cab and trailer body which permits the trailer front end to be shielded at all times. The wings are hinged against the cab and are held in toward the body by springs. The rear edges of the wings are equipped with rollers which roll against the body as it turns. Overall length is 45 ft. and the trailer body alone is 34 ft. 3⅞ in. long. The front end is rounded and all wheels are housed.

AMA Reports Sales Gain

Factory sales of automobiles and trucks for September, as reported by the Automobile Manufacturers Association, were 168,166, a gain of 20 per cent over the 139,820 units reported for September, 1936. August sales were 405,064. For nine months of 1937 the total was 3,947,559, a gain of 14 per cent over the 3,461,468 units sold in the like period in 1936. The report was based on factory shipments of all major producers in the United States.

Pontiac Prices

Pontiac division of General Motors has revised its new 1938 price list and the new schedule takes precedence over previously published figures. Advertised delivered prices at Pontiac, Mich., including all cost items excepting local taxes and transportation from Pontiac, are as follows:

Model	Six	Eight
Coupe	$835	$898
Sport coupe	891	955
Cabriolet	993	1057
2-door sedan	865	934
2-door touring sedan	891	960
4-door sedan	916	980
4-door touring sedan	942	1006
Convertible phaeton	1310	1353

On a comparable basis with 1937 prices in effect since August, the new range reveals an average increase from 3.2 per cent to less than nine per cent.

Features at Paris Show

One-fifth of the 298 cars exhibited at the Paris Automobile Show, which opened Oct. 7 in the Grand Palais, were in blue of one shade or another with black and gray jointly taking second place, according to Philip H. Chase, color specialist of the Duco Color Advisory Service. Black was the most popular color at the show last year and has been a leader in color selection for a long time. Maroon also climbed up near the top, going into fourth place with yellow, green, beige, brown and red following, in the order given. Brown was a prominent color last year. There was an increase in the use of metallic colors this year.

Of the number of cars shown, 227 were by 48 automobile manufacturers, 33 by 12 body makers, and 38 by 12 dealers. Of the automobile manufacturers, 21 were French, ten American, five English, five German, four Italian, two Czecho-Slovakian, and one Belgian. All of the body makers were French. Streamlining was applied conservatively, and there were more open cars than usual.

Fancy louvers are again very prevalent, creating the impression generally that the pendulum is at the end of its swing toward simplicity in decoration and the use of a single color in this respect. About a third of the radiators on the cars exhibited were chromium plated, while the remainder were painted. Pressed steel wheels represented about two-thirds of the total, with disk wheels next in popularity and wire wheels last. The popularity of mounting headlights in the front fenders seems to be steadily increasing.

Reports on Road Lighting

Experiments in Oklahoma and Texas on highway lighting, described at the National Safety Council safety congress held in Kansas City, Oct. 11-15, produced the result that accidents increased rather than decreased with incandescent lighting at the subject places. Reflectorized signs and centerline markings of various sorts produced far better results at lower cost, although it was admitted by the writer of the paper, Reynolds Weaver, traffic engineer of Oklahoma City, that perhaps illumination of the approaches to intersections several hundred feet back, in addition to lighting the intersections, might have proven more successful. Mr. Weaver remarked that a night driving speed limit would probably prove valuable in reducing night accidents.

Business in Brief

Written by the Guaranty Trust Co., New York

General Business Holds

General business activity during the week ended October 2 was maintained at the high rate of the preceding week. Retail trade for the country as a whole ranged from 5 to 18 per cent above that in the corresponding period last year. The weekly business index compiled by the *Journal of Commerce* stood at 103.4, as compared with 103.3 the week before and 99.5 a year ago.

According to the Board of Governors of the Federal Reserve System, aggregate net earnings of large industrial corporations during the second quarter of this year were 20 per cent above those in the corresponding period in 1936. Earnings during the first quarter exceeded those a year ago by 50 per cent. It is estimated that earnings of these corporations for the first nine months of this year were about 30 per cent larger than in the corresponding period last year.

Railway freight loadings during the week ended October 2 totaled 847,245 cars, which marks an increase of 6799 cars above those in the preceding week, a rise of 27,648 cars above those a year ago, and a gain of 141,271 cars above those two years ago.

Food Costs Stiffen

According to the United States Department of Labor, the retail cost of food during the month ended September 14 advanced moderately. This increase marks the reversal of the moderate downward trend in the few months preceding. The current index stands at 85.8, based on the 1923-25 average as 100, as compared with 85.5 a month earlier and 108.0 on the corresponding date in 1929.

Production of electricity by the electric light and power industry in the United States during the week ended October 2 was 5.5 per cent above that in the corresponding period last year.

Lumber production during the week ended September 25 stood at 75 per cent of the 1929 weekly average. Output was 26 per cent larger than new business and 11 per cent greater than shipments.

Fisher Index at Low

Professor Fisher's index of wholesale commodity prices for the week ended October 9 stood at 89.8, the lowest for this year, as compared with 90.7 the week before and 92.2 two weeks before.

The consolidated statement of the Federal Reserve banks for the week ended October 6 showed a decline of $1,000,000 in holdings of discounted bills. Holdings of bills bought in the open market and Government securities remained unchanged. Money in circulation increased $49,000,000, and the monetary gold stock rose $31,000,000.

Automotive Metal Markets

Some Orders for Steel Are Placed With No Concern Over Delivery Dates as Mill Schedules Are Quite Open

Parts makers are calling for more steel and virtually all automobile manufacturers have placed orders, some for round tonnages for assembly needs over the next four weeks. Here and there one hears steel sellers complain that automotive consumers are overcautious and are again "making too many bites of a cherry," which, they say, makes it more difficult, especially for the smaller steel producers, to map out advantageous operating schedules. It is well recognized, however, that under present circumstances buyers would have little to gain from committing themselves for steel that they are not likely to need before December. The one exception is finished sheets, for which the necessary reservations have been made or are being made, to give mills ample time for production.

In the matter of fourth-quarter prices consumers have nothing to gain from buying ahead, and anxiety over obtaining shipments on time has disappeared. A veteran steel market observer is of the opinion that the last few weeks' dip in mill operating rates is principally due to the running out of old orders, placed at prices ruling before the advances announced in March. These, he says, became really effective later than was expected. It is certain, however, that the bulk of automotive consumption in the second half of the year carried billings at the marked-up prices. It is one of the steel market's paradoxes that sellers strive for all possible buying in advance, while complaining of the time lag between announcement of price advances and their showing up in their billings.

Announcement by the Ford Motor Company of plans to expand the facilities of the River Rouge blast furnace and rolling mill equipment, to provide half of the company's steel requirements, caused some steel sellers to wonder whether release of this news was not purposely timed to coincide with the down-in-the-mouth frame of mind in which the steel industry finds itself at present, with a possible effect on price programs.

Copper market conditions continue to reflect the uncertainty that causes London speculators to liquidate one day and reinstate their lines the next. A prominent custom smelter in New York chalked up a 12-cent price in the hope of attracting in a jiffy as much business as his intake would permit him to book, but while he had the market all to himself, his bookings failed to come anywhere near expectations early in the week. While some of the producers matched the 12-cent price for quotation purposes, they were not booking any business at that figure from "independent" consumers, and some held to 13-cents. "Outside" holders asked 12⅛ cents.

The tin market continues to move up and down almost entirely in response to weather the wind blows cold or hot in Wall Street. The price quoted for spot Straits at the beginning of the week was 54⅛ cents, which denotes a recession of about 10 per cent from the high of August. A good deal of tin is being bought privately in Singapore these days, the leading steel producer covering requirements for tin plate by direct purchases in that market.

Storage battery manufacturers are slow in covering their nearby lead requirements, the market for that metal being quoted at 5.90 @ 6 cents, New York. Weakness in the European zinc markets makes for hesitancy on the part of buyers here.

—W. C. H.

Wide World Photo

TRACK-TYPE motorcycle invented by A. Lehaitre, member of the Technician and Engineer Association of France. He is turning the machine over to the government. The arrangement permits passage over terrain which would stop an ordinary motorcycle.

L. B. Dickie

Luke B. Dickie, 56, export sales manager of the Willys-Overland Motors, Inc., died in St. Vincent's Hospital, Toledo, recently.

. . . *slants*

DOUBTLESS BUILT FOR ONE—*Chicago ran a speed contest for various types of vehicles in the midst of noontime traffic and what won but a bicycle which covered about a mile downtown in 11½ min., shading by half a minute a taxi and the elevated train which covers the same route. Time for a private automobile was 12 min., for a horse 12½, for a pedestrian 12¾, for a bus 23 and for a street car 24.*

VACATION CHOICES—*Fifty-six per cent of the employes of the Acheson Colloids Corp., entitled to vacations with pay, preferred to work at double*

pay over the vacation periods under an option provided by the company. Only 22 per cent took full vacations with pay, the remaining 22 per cent taking half and half. Those with longer periods of service took more vacation proportionately.

LONG TRIP—*The first trip by truck between Alaska and the United States is to be attempted this month. It will leave Ketchikan, Alaska, Oct. 18 and is expected to arrive in New York not later than Oct. 30. A Dodge 1½-ton truck will be used and will carry a load of Matanuska district potatoes. The distance is about 4700 miles. No automobiles or trucks have ever traveled over parts of the route which enters the United States at Seattle.*

Company Earnings

Libbey-Owens-Ford

Libbey-Owens-Ford Glass Co. reported a net profit of $8,848,158 or $3.53 a share for the first nine months of 1937 against $7,369,960 or $2.94 a share in the like period last year. John D. Biggers, president, said shipments in third quarter were considerably in excess of corresponding period last year and that the working forces are steadily employed.

Austin Motor, Ltd.

The Austin Motor Co., Ltd., reported for the year ended July 31 net income of £573,531 ($2,844,708) against £571,169 $2,832,998) for the preceding year.

du Pont Exhibit Opens

E. I. duPont de Nemours Co., Inc., opened an exhibition of various chemical products at the Franklin Institute in Philadelphia, Oct. 13, which includes a number of the developments becoming widely used in automotive construction. Included were "Lucite" a clear plastic used for steering wheels and for instrument panel aperture coverings, "Neoprene," a synthetic rubber-like product having long life, and "Cordura" rayon, a very strong yarn now being used in the carcass of truck and bus tires where high heat-resisting qualities are desirable. There are also on display, flame-resisting and water-repelling fabrics and a variety of finishes and several of the plastics used in the manufacture of safety glass.

40 Years Ago

with the ancestors of AUTOMOTIVE INDUSTRIES

The Trolley Road Wagon

Part 1

W. G. Caffrey, of Reno, Nev., has been carrying on experiments for several years to develop a trolley road wagon which could be successfully used in outlying districts where water power is available for the generation of electricity. . . .

A line of ordinary poles was set up and the dynamo placed therein. The two wires were secured to the poles about 18 inches apart and 17 feet above the ground, and a trolley with a lazy tongs arrangement allowed the current to be furnished to the wagon. The problem which the inventor had to solve was a difficult one, as a perfect circuit must be maintained at all times and the contact must be flexible enough to allow a wide divergence from the regular road if necessary.

The improved form of trolley works admirably. It consists of a metallic frame having two over-running wheels, and underneath these are the two locking wheels, which effectually prevent the top wheels from leaving the wire and still allow the frame to pass the support holding the wire on the pole. On the lower wire a similar device is used. The two trolleys are connected by an insulated pantograph or lazy tongs equipped with suitable guides, thus providing for unequal tension on the trolley wires.

—From *The Horseless Age*, Oct., 1897.

Exports Far Over 1936 Volume

All Classes of Passenger Cars and Trucks Sent Abroad in Larger Numbers in August

	AUGUST 1937		AUGUST 1936		EIGHT MONTHS ENDED AUGUST 1937		1936	
	No.	Value	No.	Value	No.	Value	No.	Value
EXPORTS								
Automobiles, parts and accessories		$ 23,148,905		$ 12,359,003		$ 228,630,963		$ 162,097,729
PASSENGER CARS								
Passenger cars and chassis	11,939	6,222,638	8,209	4,186,011	154,340	89,756,997	121,206	67,987,559
Low price range $850 inclusive	11,142	5,343,099	7,902	3,830,900	141,188	75,147,126	111,816	57,423,358
Medium price range over $850 to $1,200	687	633,452	250	242,263	10,784	10,244,830	7,650	7,373,210
$1,200 to $2,000	82	118,445	38	57,552	1,736	2,662,471	1,180	1,745,880
Over $2,000	28	124,841	19	55,296	632	1,704,571	560	1,445,113
COMMERCIAL VEHICLES								
Motor trucks, buses and chassis (total)	16,830	10,439,210	7,385	3,858,305	108,213	63,012,403	74,890	37,892,857
Under one ton	2,433	972,260	1,195	451,379	14,101	5,585,403	11,891	4,501,923
One and up to 1½ tons	10,718	5,134,124	5,119	2,516,171	72,457	35,134,624	49,421	22,684,748
Over 1½ tons to 2½ tons	2,659	1,964,756	891	697,608	15,864	11,873,875	9,729	6,992,521
Over 2½ tons	898	2,238,100	141	157,579	4,821	9,616,128	2,026	2,854,598
Bus Chassis	122	129,970	39	35,568	970	802,373	1,823	859,067
PARTS, ETC.								
Parts except engines and tires								
Automobile unit assemblies		2,415,339		1,597,139		37,059,698		29,069,525
Automobile parts for replacement (n.e.s.)		2,884,687		1,975,239		25,125,635		17,467,225
Other automobile accessories (n.e.s.)		361,784		243,230		2,904,326		2,090,220
Automobile service appliances		498,786		309,598		4,485,360		2,864,692
Airplanes, seaplanes and other aircraft	88	3,435,512	58	1,180,730	411	13,731,895	352	7,597,099
Parts of airplanes, except engines and tires		1,270,883		483,451		6,526,185		3,583,721
INTERNAL COMBUSTION ENGINES								
Stationary and Portable								
Diesel and semi-Diesel	80	186,933	27	63,722	565	1,365,545	282	813,689
Other stationary and portable								
Not over 10 hp.	1,108	76,095	825	61,613	13,921	749,978	7,658	478,437
Over 10 hp.	244	133,116	158	80,325	2,451	1,168,079	1,562	638,642
Automobile engines for:								
Motor trucks and buses	1,890	182,583	361	42,444	21,315	2,120,379	15,317	1,482,678
Passenger cars	1,713	137,575	523	43,268	60,352	4,114,926	33,480	2,301,556
Aircraft	79	415,073	87	843,980	712	3,902,039	496	2,546,748
Accessories and parts (carburetors)		190,582		140,150		1,857,422		1,303,107
IMPORTS								
Automobiles and chassis (dutiable)	131	65,144	89	35,688	1,243	781,378	503	250,079

$750–$1000 Cars Gain in August

*U.S. New Car Registrations and Estimated Dollar Volume by Retail Price Classes**

	New Registrations				Estimated Dollar Volume			
	August †		First Eight Months					
	Units	Per Cent of Total	Units	Per Cent of Total	August †	Per Cent of Total	First Eight Months	Per Cent of Total
Chevrolet, Ford and Plymouth	165,886	55.24	1,539,429	58.02	$115,200,000	48.22	$1,065,500,000	50.80
Others under $750	5,147	1.71	39,963	1.51	2,900,000	1.21	22,800,000	1.09
$751-$1000	112,531	††37.47	928,253	34.98	98,300,000	41.15	810,900,000	38.67
$1001-$1500	14,460	4.82	125,953	4.75	17,400,000	7.28	151,700,000	7.23
$1501-$2000	1,107	0.37	9,342	0.35	1,900,000	0.80	16,100,000	0.77
$2001-$3000	1,012	0.34	8,547	0.32	2,600,000	1.09	22,500,000	1.07
$3000 and over	151	0.05	1,894	0.07	600,000	0.25	7,800,000	0.37
Total	300,294	100.00	2,653,381	100.00	$238,900,000	100.00	$2,097,300,000	100.00
Miscellaneous	120		1,029					
Total	300,414		2,654,410					

* All calculations are based on delivered price at factory of the five-passenger, four-door sedan, in conjunction with actual new car registrations of each model. The total dollar volumes are then consolidated by price classes.

† Does not include data for returns from Wisconsin.

†† This figure was 35.64 in July.

NEW MODEL in the Dodge truck line. It has a seven-foot stake body mounted on a 120-in. wheelbase and is included in the ¾ to one ton range. There is also available a nine-foot body on a 136-in. wheelbase. Power take-off opening is provided in the right side of the transmission. Front end styling conforms with the passenger line.

More "Wild Cats"

(Continued from page 500)

About 400 employes of the Milwaukee Avenue plant of Fisher Body Corp., members of the UAW, staged a sitdown strike Oct. 8 in protest against new piece work rates. After holding the plant from 1 p. m. to 9 p. m., the men left voluntarily. Negotiations were started early on Oct. 9 and were continued all through Sunday and until 3.30 a. m. Oct. 11 before an agreement was reached. Operations were resumed with the 3 o'clock shift Monday afternoon. The plant, which makes stampings, employs 1600 workers.

It was the first "wild cat" strike in a GM plant since the corporation's agreement with the union, reached nearly a month ago, and which granted management the right to discharge or otherwise discipline employes responsible for unauthorized strikes. It created an embarrassing situation for union leaders who are in conference with GM officials attempting to negotiate revisions in the contract with the corporation.

The following statement was issued by Elmer Dowell, international organizer: "The strike was occasioned by a misunderstanding. The matter has been settled satisfactorily so far as the UAW and the management are concerned. An investigation of the whole affair is in progress. Any further actions relative to this affair will be determined by the outcome of the investigation now in progress."

Seven plants of Bohn Aluminum & Brass Corp. were closed the morning of Oct. 11 by an unauthorized sitdown strike of 3500 employes, members of the UAW, who struck in sympathy with six maintenance men. The latter refused to work on Saturdays. S. D. Den Uyl, secretary of the company, stated: "The union has again failed to live up to its contract with our company. The strike is uncalled for and demonstrates the lack of control that the union has over its members.

"The six maintenance men," Den Uyl explained, "refused to work last Saturday, although the contract specifically gives us the right to work them Saturdays if necessary. The UAW agrees with this interpretation of the contract. We told the men there would be no further work for them. Monday morning, the other workers in the plants sat down in sympathy as soon as they came to work."

UAW officials, who admitted the strike was unauthorized, arranged for an immediate conference with the company.

Another automobile parts plant was closed by a sitdown strike Oct. 7. Approximately 700 employes of Clayton & Lambert Mfg. Co., Detroit, were made idle when a dispute over the transfer of six men from the bumping department, which was being closed, to another department resulted in a sympathetic sitdown. Other issues, according to the union, were wage reductions and the farming out of work to other shops. The men are holding the plant by shifts.

Several reverses have been suffered by the CIO in recent plant elections conducted by the NLRB. At Grand Rapids, Mich., employes of the W. B. Jarvis Co. voted 397 to 337 against the UAW as their sole representative for collective bargaining. Employes of the Peerless Cement Corp. in Detroit voted 73 to 51 for an independent association of employes to represent them in collective bargaining. Previously in Detroit, an independent association of gas workers had won over the CIO in an election for employes by a ratio of two to one. And at the International Harvester plant in Springfield, Ohio, the UAW lost to an independent association by a vote of 1418 to 3753.

UAW at Goodyear on Coast

The National Labor Relations Board has certified that the United Rubber Workers of America, Local No. 131, has been designated by majority of the production and maintenance employes of the Goodyear Tire & Rubber Co., Los Angeles, to represent them in bargaining collectively with the management in respect to rates of pay, wages, hours, and other conditions of employment. The URW will represent the workers at the textile plant of the company. However, foremen, squadron men, and those engaged in supervisory and clerical work are not included in the bargaining unit.

Plant Notes

Expansions and Removals Are Announced

The Joyce-Cridland Co., Dayton, Ohio, is completing a new factory unit in which will be expanded its production of lifts. The new building is ultra-modern in design and has four-fifths of its wall area in glass. It is a single-floor steel frame, monitor type and production is along a continuous line. Heavy products are handled with monorail transfer cranes and loading docks are located inside the building. Offices are air conditioned while plant worker comfort is provided for by wash fountains, locker rooms and shower baths.

Moraine Products division of General Motors Corp. has occupied its new plant at Dayton, Ohio. The plant has larger laboratory, manufacturing and business facilities.

Kelsey-Hayes Wheel Co., Detroit, has under consideration a plan for the construction of a plant near Pittsburgh, but has made no definite commitment as yet.

Purchase of a 40-acre tract of land just outside the limits of Detroit is announced by Carboloy Co., Inc., Detroit, Mich. It is planned to build a factory on this site to manufacture cemented carbide tools, dies and wheel dressers. No details as to the size or nature of the structure are available as yet, as plans for the factory have not been completed.

Le Roi Co., West Allis, Milwaukee, has leased 25,000 sq. ft. in the Factory Arcade, adjacent to its plant, largely to accommodate assembly of air compressors. A similar amount of space is thereby released for general manufacture of gasoline and oil engines for the industrial field. The lease is for three years with an option of renewal. Charles W. Pendock is president and general manager.

Auto Products Co., Cedarburg, Wis., manufacturer of hub caps and other replacement parts, is preparing to move its factory to Whitewater, Wis., where it will occupy the plant of the Whitnall Conveyor Co., which is moving into the former Cummings-Hickey roller rink building, now being prepared for its occupancy. The present Auto Products force of 30 workmen will be substantially augmented after the transfer of operations is completed.

Globe-Union, Inc., Milwaukee, manufacturer of storage batteries, spark plugs, radio parts, etc., has moved its branch factory at Seattle, Wash., into a new building, 100 x 160 ft., giving it a local production capacity of 500 batteries daily. The Seattle factory was established about four years ago and was supplemented during the past 18 months with an additional production unit for batteries at Los Angeles.

The Boeing Aircraft Co., Seattle, has just completed a factory expansion program including a naddition to its new plant No. 2 adjacent to Boeing Field, Seattle, which more than doubles the size of the original building that was

constructed on the site last year. The new plant, now embracing a floor area of 135,000 sq. ft. plus 21,000 sq. ft. of balcony space, will be used for subassembly work and final assembly of all four-engined landplanes including both transports and bombers. With the enlarged plant No. 2 in service, the company's main plant will be devoted to primary work on parts of all planes and complete assembly of four-engined flying boats.

Machine Tool Orders Rise

The total volume of new machine tool orders placed in September exceeded the volume placed in any of the three preceding months, reversing the downtrend of the three months' average which began in May, according to the National Machine Tool Builders' Association. Domestic orders were down less than 10 per cent from August, foreign orders increasing sufficiently to raise the total.

GM Institute Program

General Motors Institute has completed its 1936-37 school year with a record total of 12,380 men and women receiving instruction in the varied courses offered, according to an announcement by Major Albert E. Sobey, director of the institute in Flint, Mich. Approximately 1,250,000 man-hours of instruction, including conference hours involved in advance training were reported, compared with 1,060,000 hours in the preceding year. The institute's 1937-38 program is under way with prospects of an even larger enrollment. Of those enrolled last year, 7282 were in the foremanship and executive training program under Institute leadership, a program designed to help the supervisory force in General Motors plants in their relations with men and their jobs. An additional 3256 were enrolled in the spare time study program.

MEMA Adds 16 Members

The Motor and Equipment Manufacturers Association announces that sixteen more manufacturers of automotive products have become affiliated with the MEMA.

Following are the names of the new companies: Aircraft Specialties, Inc., Lapeer, Mich.; Anthes Force Oiler Co., Fort Madison, Iowa; Clifton Manufacturing Co., Waco, Texas; Crowe Name Plate & Mfg. Co., Chicago, Ill.; The Drackett Products Co., Cincinnati, Ohio; Economy Electric Lantern Co., Inc., Chicago, Ill.; Fowler-Pem Co., Emeryville, Cal.; Hawley Manufacturing Co., Inc., Chester, Pa.; Homestead Valve Mfg. Co., Coraopolis, Pa.; Linendoll Corp., Chicago, Ill.; The Lubrication Corp., Chicago, Ill.; L. J. Miley Co., Chicago, Ill.; Parts Manufacturing Corp., Brooklyn, N. Y.; Ryder Manufacturing Co., Inc., Chicago, Ill.; Steel Materials Corp., Detroit, Mich.; Sure-Rite Products Corp., Philadelphia, Pa.

A. O. Smith Shipments Large

A. O. Smith Corp., Milwaukee, is shipping an average of 100 freight car loads of automobile frames a day, approximating the releases of a year ago. The company, it is understood, has been able to build up a large inventory of frames in advance of production demands. A year ago it was not possible to do so because of the important changes in frame specifications requiring extensive retooling as specifications were made definite.

TOOLS OF TOMORROW

Finishing Gear Teeth

. . . new machine by Fellows uses enveloping generating principle

A new machine for finishing gear teeth by the enveloping generating process was recently brought out by the Fellows Gear Shaper Co., Springfield, Vt. The equipment will accommodate gears up to 8 in. pitch diameter, 2½ in. face width and 4 diametral pitch.

The principle employed in removing metal by this process differs from conventional gear cutting methods as follows: Tool and work are rotated together without control by any indexing mechanism; cutting is accomplished by setting axes of tool and work askew to each other and by bringing the tool into contact with the work under pressure; the tool is rotated at high speed and traversed at low speed, first in one direction to finish one side of the teeth, then reversed in direction of rotation and traversed in the opposite direction to finish the other side of the teeth. When tool reciprocation is not restricted, the tool is traversed for a distance slightly greater than the gear face width, and one complete cycle finishes the gear.

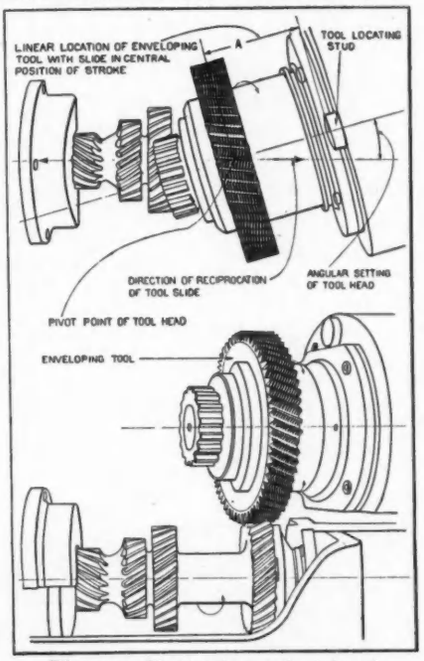

LINEAR LOCATION OF ENVELOPING TOOL WITH SLIDE IN CENTRAL POSITION OF STROKE
A
TOOL LOCATING STUD
DIRECTION OF RECIPROCATION OF TOOL SLIDE
ANGULAR SETTING OF TOOL HEAD
PIVOT POINT OF TOOL HEAD
ENVELOPING TOOL

Diagram illustrating principle of operation of the Fellows enveloping gear generator for finishing spur and helical external and internal gears.

Where full face width reciprocation is restricted by a shoulder, the work is fed steadily upward into the tool, the latter being reciprocated about 1/32 in. to enhance the cutting action and improve finish. This upward feeding action continues for a predetermined time, the tool making one or more cycles depending on amount of material to be removed.

Tools used on this machine are made in a variety of types depending upon the character and shape of the work and other conditions.

Plastic Injection

. . . Reed - Prentice No. 10 molding machine improved.

A number of improvements have been incorporated into the model No. 10 plastic injection molding machine which was brought out several months ago by the Reed-Prentice Corp., Worcester, Mass.

According to the manufacturer, the changes include an increase in the thickness of the stationary die plate to 4⅞ in. Thickness of the movable die plate has also been increased and is now 4½ in.

A larger capacity pump is furnished giving 120 in. per min. continuous material plunger speed. Regular equipment now includes an automatic indicating control pyrometer. In addition, two rheostats are supplied, one for the rear of the heat unit for independent control of heat to front and rear heating bands.

Minor improvements include improved timing units and location of timers and push buttons and dials for easier operation. Also supplied on the latest model of this machine are a Nitraloy material plunger and a Nitraloy sleeve in the plunger cylinder to eliminate any possibility of scoring.

Tool Grinder

. . . new Sundstrand models supersede three - wheel machines formerly made.

A tool grinder has been announced by Sundstrand Machine Tool Co., Rockford, Ill., which supersedes the three-wheel tool grinder formerly manufactured by the company. Two models are offered. Model A has a rough grinding wheel which operates at 950 r.p.m., a finishing wheel which operates at 3600 r.p.m. On the model B the rough-grinding wheel operates at 2100 r.p.m., the finishing wheel at 3600 r.p.m.

The Sundstrand tool grinder has a grain wheel for rough grinding and a diamond-faced wheel for finishing. Tilting of work tables above or below horizontal is indicated on direct reading scales. In rough grinding, a tool is clamped securely in position and passed across the face of the cup-shaped grain wheel by a rocking motion of the table support. According to

(Turn to page 517, please)

AUTOMOTIVE ABSTRACTS

Surface Hardening by the Oxy-Acetylene Torch

The surface hardening of steel parts by means of the oxy-acetylene flame has long been familiar. The process is carried out by heating the surface to be hardened by means of a welding torch as rapidly as possible and quenching it immediately. Years ago, gear teeth were hardened in this way. The results, however, were generally unsatisfactory, primarily because unskilled manipulation of the torch often led to uneven heating of the surface and consequently to irregularities in the degree and depth of the hardness.

In order to obtain a satisfactory case with this method of hardening, the parts must be heated extremely rapidly beyond the AC_3 point and then quenched immediately. This transforms the ferrite-pearlite structure of the heated surface layer into a martensite structure, this latter merging gradually into the ferrite-pearlite structure of the core. If heating were not effected very rapidly, the heat would penetrate into the interior of the part to be case hardened, with the result that either the surface would not be hardened at all or the case would be too deep. This calls for the use of very powerful torches.

To harden satisfactorily when subjected to this process, steel must have a carbon content of at least 0.35 per cent, but 0.45 per cent is better. Tempering steels with a correspondingly high carbon content and steels that do not contain an excess of manganese (the limit being about 1.2 per cent) can also be hardened well, as can gray cast iron and cast steel, provided there is at least 0.35 per cent of combined carbon present.

There are two different methods of torch-hardening. In one, known as cover hardening, the whole of the surface to be hardened is simultaneously heated and then simultaneously quenched. The other process is known as linear hardening. With this the work piece is hardened line by line, as it were, a quenching spray following the heating torch at a short interval. A slow traverse motion takes place between the torch and the spray on the one hand and the work piece on the other.

Torch hardening is best adapted to quantity production, because as a rule a special and rather expensive torch must be built for each part to be hardened.

In order to obtain by this process a case that is uniform in hardness and depth, the relative movement between work and torch must be effected mechanically. Machines have been designed for hardening familiar parts, and most of these machines require no particular care or skill in their operation. When simple bearing parts on a shaft are to be hardened by the cover process, the shift is made by a lathe, as a rule, which has been altered to permit of a suitable movement of the torch and the quenching nozzles. In other cases a simple special device can be made to serve the purpose. However, the proper operation of such auxiliary apparatus calls for a certain amount of caution and skill, if the hardening is to be uniform in degree and depth.—Engineering Progress for September.

U.S. Truck Needs Cited

Army Feels Large Unit Output Facilities Too Small

From the standpoint of a national emergency the United States is underequipped for the production of trucks in the higher tonnage capacities according to Lt. Col. J. H. Johnson, chief of the motor transport branch of the Quartermaster General's office.[1] Under the present procurement policy of the Quartermaster's service, it is also true, Col. Johnson said, the military shortcomings of available commercial vehicles with which the "next emergency" would have to be met, might endanger the outcome.

Key vehicles from the Q.M. viewpoint are trucks in the 2½ to 3 ton classification. If manufacturers in this field would agree to the adoption of purely-dimensional standardization much would be accomplished to liquidate future worries, Col. Johnson said.

Cab-over-engine trucks are welcome in Q.M. circles. Noting that they promise to become a standard product in the truck industry, Col. Johnson said, "the sooner you get them the better." He deplored lack of commercial facilities for the production of multi-wheel drive trucks, particularly in lighter classifications.

Ordnance procurement problems were outlined by Major John K. Christmas,[1] chief of the automotive division in the office of the Chief of Ordnance. Production of commercial tractors with higher road and cross-country speeds is of favorable import to ordnance's problem of fast, mobile prime movers, he indicated.

Pointing out that motorized and mechanized military units are an economy in men and money in time of emergency,[2] he advanced the hope that all possible units would be on an m-m basis within the near future.

[1] Views presented at a symposium on "Commercial Motor Vehicles in the Military Service." Service-connected speakers offered the usual disclaimer that opinions advanced were not in all cases those of the War Department. A meeting of the Washington Section, S.A.E. on Oct. 12 was the scene.

[2] See "The Combat Vehicle," by Major John K. Christmas, AUTOMOTIVE INDUSTRIES, Aug. 21, 1937, p. 260 *et seq.* "Four Decades of Mechanization in the U. S. Army," by Captain Robert J. Icks, AUTOMOTIVE INDUSTRIES, Sept. 25, 1937, p. 414 *et seq.*, Oct. 9, 1937, p. 482 *et seq.*

SAE Ordnance Rubber Unit

Co-operating with the United States Army at the request of the Chief of Ordnance, the SAE Ordnance Advisory Committee has organized a subcommittee on rubber products. It will advise on the development of ordnance

CAB-OVER-ENGINE model as introduced by the Diamond T Motor Car Co. The line comprises five models ranging from 1½ to 4 tons capacity on seven wheelbases. Standard wheelbases range from 96 to 132 in. while with double-drop frames, optional wheelbase of 168, 180 and 192 in. are available. The trucks measure only 24 in. from the front axle to the back of the cab. The entire engine, radiator, clutch and transmission assembly is carried in a subframe which can be withdrawn from the front for servicing as shown at the left. Among the other arrangements for servicing are easily-removable cover plates and a duplex gage on the dashboard that shows the crankcase oil level. Rubber is freely used for supports and in spring bushings. Long, soft springs with built-in shock absorbers are provided on all models.

rubber products of non-commercial application and methods to secure the aid of the rubber industry in the program. It will also advise on the adaptation of industrial rubber products to ordnance use. The subcommittee is headed by J. E. Hale, Firestone Tire & Rubber Co. with L. M. Kubaugh as alternate. On the subcommittee are K. D. Smith, B. F. Goodrich Co., with H. Schippel as alternate; G. K. Henshaw, Goodyear Tire & Rubber Co. with R. T. Brown as alternate, and Dr. S. M. Cadwell, U. S. Rubber Products, Inc., with E. Botts as alternate. Representing the United States Army on the subcommittee are Lt.-Col. B. O. Lewis with W. F. Beasley as alternate; Maj. J. K. Christmas with Capt. E. L. Cummings and H. W. Evans as alternates; Col. W. A. Capron with Dr. A. C. Hanson as alternate, and Maj. W. W. Warner. Heading the Ordnance Committee of the SAE are Chairman H. W. Alden and Col. G. F. Jenks, Ordnance Department, United States Army.

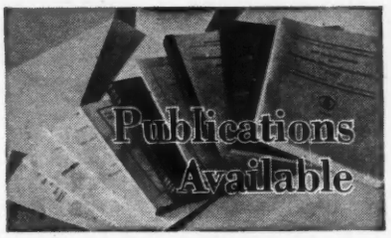
Korbel, Colwell Birthday

October 27, opening date of the National Automobile Show in Grand Central Palace, happens by coincidence to be the twenty-fifth anniversary of the beginning of the partnership of Edward F. Korbel and Worth Colwell, counselors in public relations and publicity. For that number of consecutive years this combination has been in charge of publicity for the industry's annual show.

One of their most satisfactory recollections is that they handled the initial "Safety First" campaign fostered by automobile interests and others 'way back in 1912.

Ernst Flentje

Ernst Flentje, inventor and manufacturer of the Flentje double-acting shock absorbers for automobiles, died recently at the age of 81.



The Waterbury Farrel Foundry and Machine Co., Waterbury, Conn., has issued a new 20-page **bulletin**, No. 898-S, describing the company's line of gang slitting machines. The bulletin includes descriptions of winders and coilers used in conjunction with the slitters, and several special trimming machines.*

Gallmeyer & Livingston Co. has issued an illustrated folder describing its Grand Rapids **surface grinder**. Descriptions of tap and drill grinders are also included.*

Barnes Drill Co. has issued a bulletin, No. 135A, describing the company's No. 5 horizontal, self-oiling, hydraulic **honing machine**.*

Wheelco **indicating pyrometers** ranging in size from a small portable type to an eight-inch wall mounted type are described in a bulletin issued by Wheelco Instruments Co.*

Continental Diamond Fibre Co. has published a **catalog** on its "Micabond" products which includes use data.*

* Obtainable from editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia.

Seeks Old Auburn Plant

Chamber of Commerce officials of Auburn, Ind., report negotiations for the lease of a good portion of the old Auburn Automobile Co., buildings to a Warner Gear Co., Muncie, Ind., affiliate of Borg Warner Co. Several hundred persons will be employed in the plant, which covers approximately 32 acres. The Auburn parts and service divisions, which employ approximately 60 workers, will be continued in a portion of the plant.

Car Orders Larger

(Continued from page 499)

states C. L. McCuen, general manager. Before the end of the month, McCuen expects that daily production will reach 925 units.

Total production of the 1938 cars through Monday, October 11, was 13,845 he stated, a fact which has permitted every Oldsmobile dealer in the United States to obtain an initial stock of display and demonstration cars.

September sales exceeded sales in September of last year by more than 1200 units.

Sales of Studebaker passenger and commercial cars during September totaled 9541 units, according to an announcement by Paul G. Hoffmann, president of the corporation. Total sales for 1937 amount to 73,335 units as compared with 63,293 units sold during the same period of 1936, an increase of 15.9 per cent.

Nash Motors division of Nash-Kelvinator Corp. has reached peak production, having recently been at 70 to 75 per cent at its Nash-LaFayette plants in Kenosha and Racine, Wis., and the Seaman body affiliate in Milwaukee. The division is understood to be continuing its experiments in the motor truck field and is building more of the commercial cars produced earlier this year for use in transporting closed car bodies from the Seaman plant in Milwaukee to the Kenosha and Racine car factories. The body transporting fleet of some 30 cars will shortly be made up entirely of the new Nash trucks. It is stated that no definite decision has been made as to whether Nash will go into truck production on a commercial scale, but engineering studies and cost sheets are being prepared so that this manufacture can be started whenever Nash-Kelvinator officials decide to invade the truck field.

Buick division of General Motors Corp. is currently employing more than 17,000, against an average of about 16,000 for the 1937 model year, according to Harlow H. Curtice, president, who states that 15,863 cars were built in September and that 28,000 are scheduled for this month. He states that unfilled orders for 65,000 cars are on the books.

Willys-Overland has added a small third shift in an effort to increase production to 2500 cars a week. Two shifts have been working for the past two weeks.

Calendar of Coming Events

DOMESTIC SHOWS

New York, National Automobile Show, Oct. 27-Nov. 3
Toledo, O., Automobile Show. Oct. 27-Nov. 3
Boston, Mass., Automobile Show, Oct. 30-Nov. 6
Washington, D. C., Automobile Show, Oct. 30-Nov. 6
Los Angeles, Cal., Automobile Show, Oct. 30-Nov. 7
San Francisco, Automobile Show, Oct. 30-Nov. 6
Cincinnati Automobile Show. Oct. 31-Nov. 6
Altoona, Pa., Automobile Show....Nov. 2-6
Akron Automobile Show.....Nov. 6-12
Brooklyn Automobile Show.....Nov. 6-13
Chicago Automobile Show.....Nov. 6-13
Columbus Automobile Show.....Nov. 6-12
Omaha Automobile Show.....Nov. 6-11
Detroit Automobile Show.....Nov. 6-13
Motor Truck Show, 4th Annual, Newark, N. J.....Nov. 6-12
Newark, N. J., Truck Show.....Nov. 6-12
Buffalo, N. Y., Automobile Show..Nov. 6-13
Indianapolis, Automobile Show....Nov. 6-13
Newark, N. J., Automobile Show..Nov. 6-13
Philadelphia Automobile Show....Nov. 6-13
Pittsburgh, Pa., Automobile Show. Nov. 6-13
Baltimore, Md., Automobile Show, Nov. 13-20
Cleveland, Ohio, Automobile Show, Nov. 13-20
Rochester, Automobile Show.....Nov. 13-20
Springfield, Mass., Automobile Show, Nov. 14-20
St. Louis, Mo., Automobile Show. Nov. 14-21
Portland, Ore., Automobile Show. Nov. 14-21

SHOW BUSINESS

Manager of the National Automobile Show in New York is Alfred Reeves, 366 Madison Ave., N. Y. C. Inquiries concerning all matters connected with the national show should be addressed to him. AUTOMOTIVE INDUSTRIES will be pleased to furnish names and addresses of local show managers on request.

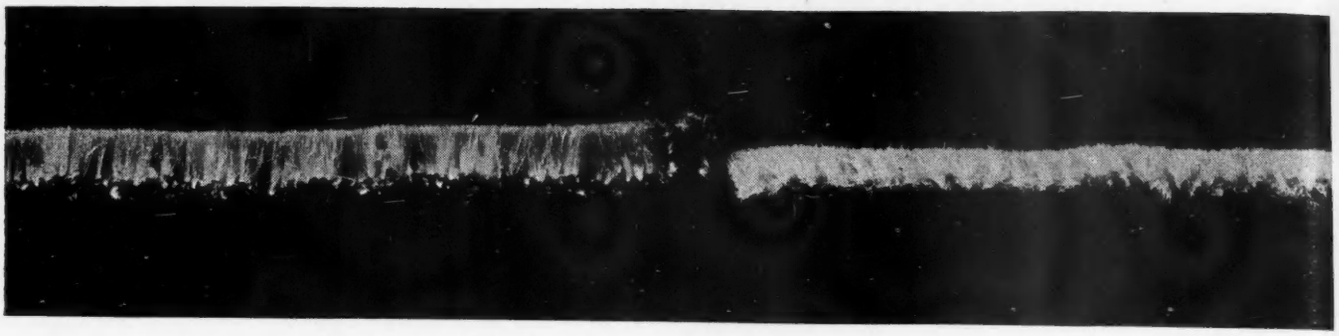
Denver, Colo., Automobile Show, Nov. 15-20
Jersey City, N. J., Automobile Show, Nov. 15-20
Milwaukee, Wis., Automobile Show, Nov. 17-24
Kansas City, Mo., Automobile Show, Nov. 27-Dec. 4
A.S.I. Show, Navy Pier, Chicago, Dec. 6-Dec. 11

FOREIGN SHOWS

France, 31st International Automobile Salon, Paris .....Oct. 7-17
Great Britain, 31st International Automobile Exposition, London...Oct. 14-23
Czechoslovakian Automobile Show, Prague .....Oct. 16-24
Italy, 10th International Automobile Salon, Milan .....Oct. 28-Nov. 8
Great Britain, 13th International Commercial Automobile Exposition (trucks and buses), London...Nov. 4-13
Toronto, Ont., Automobile Show..Nov. 6-13
Great Britain, 36th Scottish International Automobile Exposition, Glasgow .....Nov. 12-20
Montreal, Que., Automobile Show, Nov. 20-27
Peru, Automobile Show, Lima, Dec. 23-Jan. 6, 1938

CONVENTIONS AND MEETINGS

National Metal Congress, Atlantic City Oct. 18-22
National Machine Tool Builders Asso., Annual Meeting, Hot Springs, Va., Oct. 25-27
SAE Annual Dinner, Commodore Hotel, New York .....Oct. 28
American Foundrymen's Association, 2nd annual foundry conference, Iowa City .....Oct. 29-30
American Petroleum Institute, 18th Annual Meeting, Stevens Hotel, Chicago .....Nov. 8-12
SAE Regional Transportation and Maintenance Meeting, Newark, N. J. .....Nov. 9-10
International Acetylene Association, Annual Convention, Birmingham, Ala. .....Nov. 10-12
American Society of Mechanical Engineers, New York .....Dec. 6-10
SAE National Production Meeting, Flint, Mich. .....Dec. 8-10
SAE Annual Meeting, Detroit, Jan. 10-14, 1938
American Road Builders' Association, Cleveland .....Jan. 17-21, 1938



At the left old-fashioned plush shows its excessive pile length (about 3/8 in.) in scale comparison with pile of modern mohair velvet upholstery for automobiles (about 1/10th in.)

Upholstery Fabrics Are Engineered Too

By Herbert Hosking

THE unavoidable truism that automobiles are made and sold as style merchandise emphasizes the importance of upholstery fabrics as one of the trilogy of materials which have a fundamental influence on the buyer's choice of an automobile. Previous articles in this series[1] have discussed sheet steels and finishes as part of the style picture. In devoting the present article to upholstery fabrics we are conscious of considerable truth in the slogan of one upholstery supplier that so far as car buyers are concerned "they always open the door first."

While the automobile industry used in 1935 10 million sq. ft. (31 per cent) (2) of the leather upholstery material produced in the United States, since the advent of the enclosed automobile body there has been a steady decline in the use of leather; a steady turning toward the use of fabrics, which in recent years has meant cotton-base fabrics with mohair pile. In the year 1935, the mohair consumption of the automobile industry was 10 million lb. or 40 per cent[2] of the amount used in the American upholstery trade.

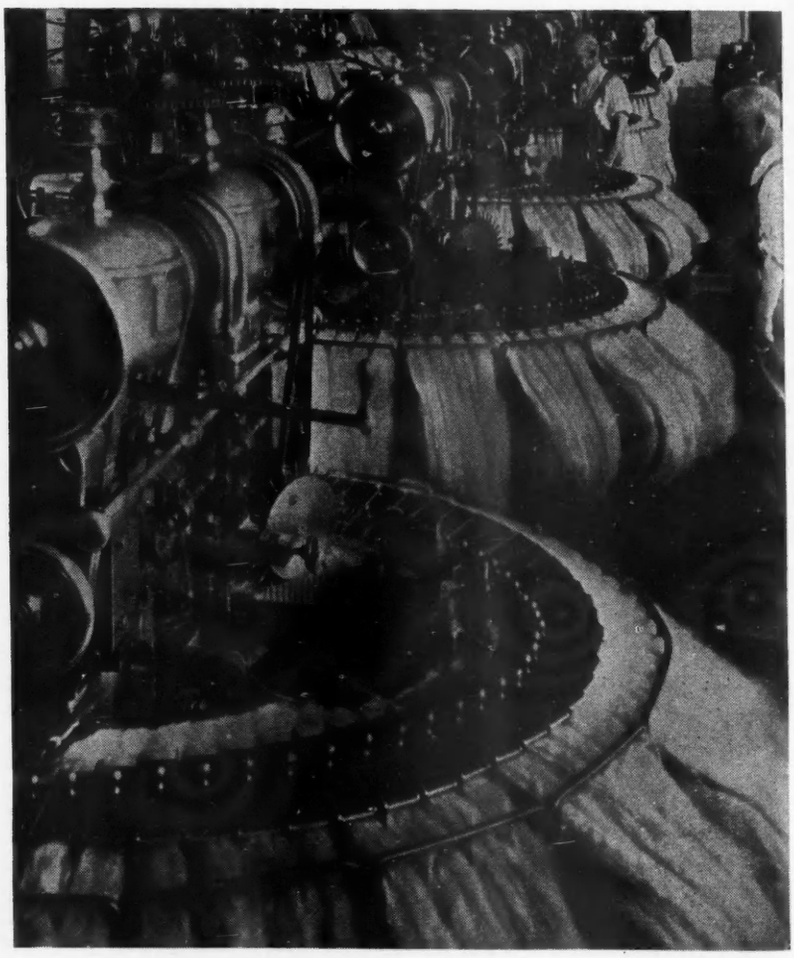
Exclusive of headlining and floor covering, it takes from 12 to 15 yds. of upholstery fabric to "treat" the average automobile. Multiplied by 4 million cars a year, this one fact has had vital repercussions in the mohair velvet industry which now supplies the greatest yardage of fabrics for use in upholstering passenger cars. Textile manufacturers have learned from the automobile industry the absolute necessity of maintaining standard qualities and colors in automobile upholstery fabrics and have developed control methods suited to such requirements. Of these, more later.

Fabrics used in upholstering automobiles fall into three classes: Flat

(1) See "Sheet Steels for the Motor Vehicles of America", by H. E. Blank, Jr., Automotive Industries, March 20, 1937, p. 456 *et seq.*

"Style Sells Cars", by H. E. Blank, Jr., Automotive Industries, April 17, 1937, p. 586 *et seq.*

(2) "Facts and Figures of the Automobile Industry", 1936 Edition.



Combing mohair yarn

Photos courtesy L. C. Chase & Co.

fabrics, pile fabrics, and coated fabrics. Bedford and whip-cords, and broadcloth are the chief members of the flat fabric group from the standpoint of automotive interest. Mohair velvets now dominate the pile fabric group, and closed-car upholstery in general. Artificial leathers of many kinds are the principal members of the coated group. In the past, coatings have been generally restricted to pyroxylin or other lacquers on which grain marking were pressed with a plate or roller. Of recent interest in the coated group is "Cavalon," a rubberized fabric introduced by DuPont. A heavy sateen or twill fabric is coated with a tough rubber compound. It may be finished in a plain color with embossing on the surface to stimulate the grain of leather, or, after embossing, the valleys of the grain may be filled with a contrasting color (either rubber cement or lacquer) to give a duotone effect. The surface of the resulting material is treated for wear resistance, either chemically, or by the application of a superficial finish such as lacquer, enamel, or varnish.

The coating of fabrics has also come into use in connection with "ventilated" mohair velvets, in which a coating of rubber is used to anchor the pile.

A flat fabric is woven in such a way that the fibers lie in a horizontal position—the sides of the fibers forming the face or wearing surface of the upholstery. A pile fabric is so woven that the fibers stand in a vertical position with reference to the base. The tightly packed ends of the fibers form the wearing surface of face or the pile fabric.

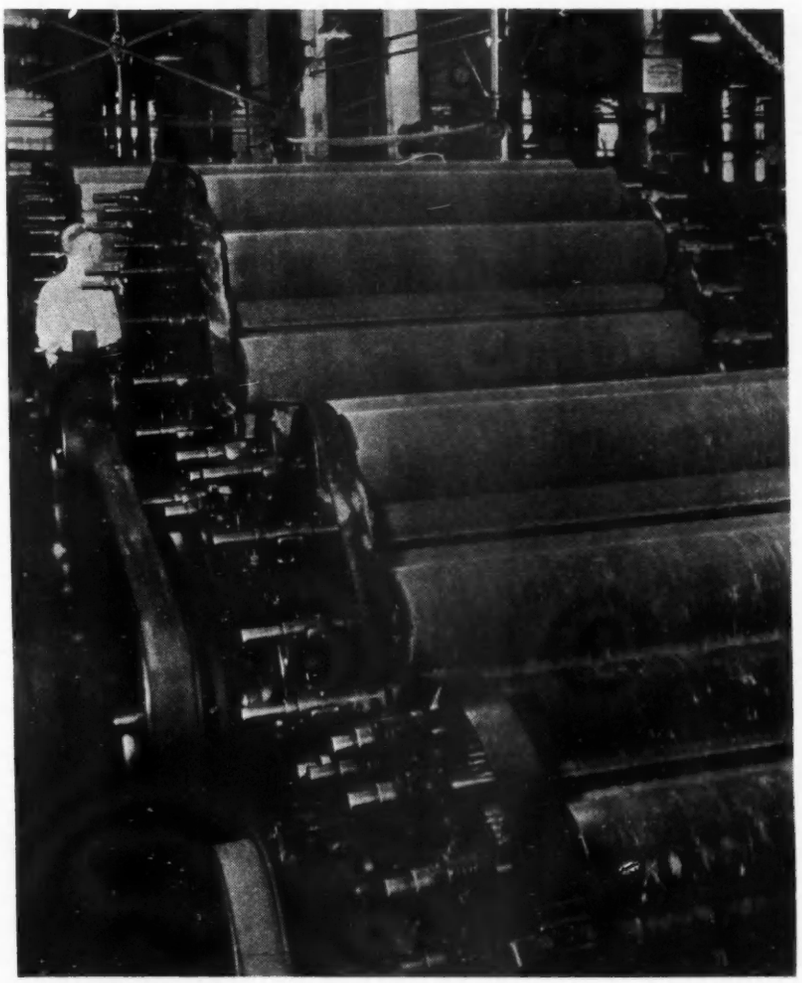
Just as definitely as metals, fabrics for automobile upholstery are engineered for their particular requirements. As a result of this tendency, the outstanding difference between the "plush" of an older day's automobile fabric and modern mohair velvet is in the length of the pile, and the methods of anchoring.

In the older pile fabrics the length of the vertical fibers approximated ⅜ in. Today, 1/10 in. has been fixed by experiment as the proper length, all factors of wear, comfort and appearance considered.

According to Bird,[3] the ideal automobile upholstery fabric should possess:

1. Long life and ability to take hard wear.

[3] "Textile Manufacture and Research", an S.A.E. paper by W. F. Bird, director of research and technical control, Collins & Aikman, Inc. Presented to Detroit Section, S.A.E., April 12, 1937.

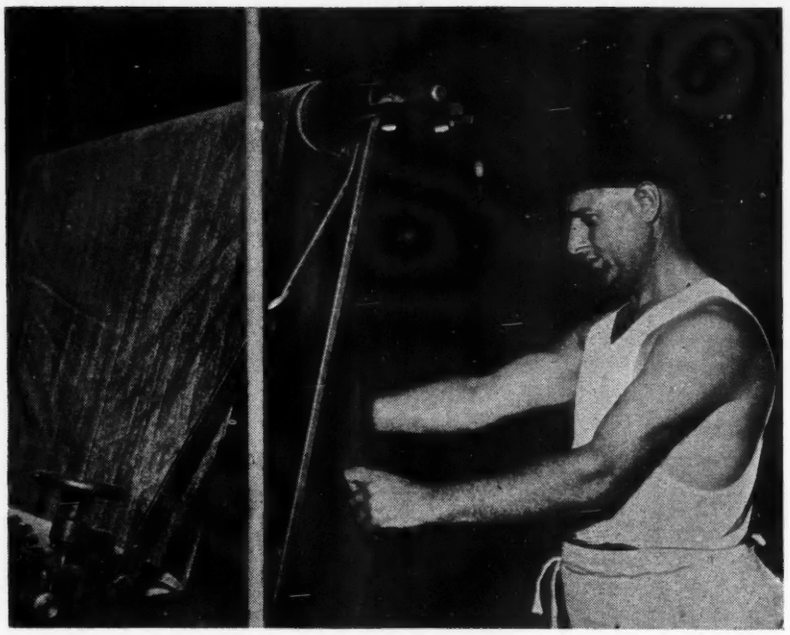


Carding mohair fibres

8 Automotive Materials

2. Maximum style and beauty.
3. Ease of handling.
4. Elasticity and softness for comfort.
5. Ventilation, for dissipation of body and interior heat.
6. Maximum resistance to spotting.

Practically all mohair velvets are



Finishing pile fabrics includes combing, heating and drying after the dye bath. Pressing may be added when a particular "lay" of the pile is desired.

woven "face to face" and subsequently split before leaving the loom. Constant uniformity of pile height is maintained by improved shearing operations which have been developed in the face of the automobile industry's requirements for a shorter pile fabric. A denser pile is achieved in the modern product by using a V weave instead of the W weave which characterized the older velvets.

All textile-manufacturing operations divide roughly into four groups: The preparatory operations, from the sorting of raw material to spinning, the weaving operations, and the dyeing and finishing group.

In flat fabrics processing woolens are distinguished from worsteds by the fact that in wool spinning no attempt is made to parallel each individual fiber in the yarn. Processes incident to its preparation have been covered in considerable detail in earlier issues of AUTOMOTIVE INDUSTRIES.[1]

Mohair fabrics, which are woven from the fleece of the Angora goat begin with a series of operations which are roughly analogous to those performed on the fleece of sheep. In the raw state, after shearing, mohair fibers are long, silky and of high luster. After sorting, washing, combing, carding, drawing, and spinning have been accomplished they are said to form the strongest and smoothest textile fiber known.

Dyeing of mohair fabrics is done in the piece, which is said to promote ease of control in the process and be best adapted to control of production quantities and inventories, coupled with minimum rejections. Most automobile fabrics are furnished in a solid color. When a Jacquard pattern is indicated, dyeing must be done in the yarn before spinning, so that two or more colors can be combined in the finished fabric.

Modern textile plants manufacturing for the automobile industry duplicate in miniature every manufacturing and inspection operation used in connection with turning out a production upholstery fabric, so that when the time comes to put a new design into production most of the bugs have been ironed out of the production lines without disturbing previous production operations.

Upholstery accounts for 7 to 10 per cent of the manufacturing cost in a five-passenger sedan. Until recent years, very little study has been given to standards governing such expenditures by motor-vehicle manufacturers. Some day there will probably be fabrics standards in the S.A.E. Handbook and they will be a paper testimony to a *de facto* conditions—that the automobile manufacturers have set difficult criteria for their upholstery requirements, and the fabric manufacturers have, generally speaking, met them in generous measure.

(1) See "Flat Fabrics of Widely Varied Design Available for Cars in All Price Classes", by Joseph Geschelin. AUTOMOTIVE INDUSTRIES, Jan. 30, 1932, p. 156 *et seq.*

Fabric inspection is made before dyeing in the piece and before the finished product is released to market. The controller at the left rotates the fabric at the inspector's will.

Photos by Hine, courtesy Sidney Blumenthal & Co.

Automotive Materials NEW DEVELOPMENTS

Additions to Lists of Suppliers of Rubber and Stainless Steel

Despite our sincere efforts to carefully check the completeness of lists naming leading manufacturers of materials published in conjunction with the current series of articles on Automotive Materials, several leading producers have directed our attention to the fact that their names were not included.

In the story on Rubber, published Aug. 21, the following companies should be added: The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J., and the Dryden Rubber Co., Chicago.

Obviously, the Firestone Tire & Rubber Co., Akron, Ohio, should also have been listed as an important source of automotive rubber products.

The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc. informs us that it is one of the largest makers of automotive vehicle parts of rubber. Further, it reports that it originated the hydraulic brake piston cup and is today one of the largest manufacturers of hydraulic brake parts; also, the first to make rubber bonded brake lining.

As stated by the Dryden Rubber Co., it ". . . is perhaps the oldest manufacturer of mechanical rubber goods for automotive products, other than tires and tubes, in the industry and is well up to the top of the list in volume of production."

Addition of the name of the Crucible Steel Co. of America, New York, should be made to the list of large producers of stainless steel given in the article on this material which appeared in the Sept. 18 issue.

Hard Cutting Tool And Wear Resisting Alloy

"Tantaloy" is the trade mark of a new hard cutting tool and wear resisting alloy developed by Fansteel Metallurgical Corp., North Chicago, Ill. It is a general purpose hard metal ordinarily used as a tip which is brazed to a steel shank to form a cutting tool.

Containing tantalum carbide, Tantaloy is said to possess the characteristics of a high degree of chip slippage which resists the development of crater by the chip action. When regrinding, Tantaloy tools require very little metal removal, thus decreasing the grinding time and increasing the useful life of the tool. According to the manufacturer, tools tipped with this material are characterized by toughness, making them efficient for service ordinarily regarded as severe, such as interrupted cuts, heavy feeds, varying hardness of metal, or tool mounting essentially deficient in rigidity.

Tantaloy tipped tools are available in all standard lathe, boring mill, and turret tool sizes; also, the metal is available in tips which may be brazed to boring bars, counter bores, or special tools. The maker recommends Tantaloy for gages, lathe centers, centerless grinder rests, wearing surfaces, and the general field of application of abrasion and corrosion resisting metal.

Bearing Alloy For Use Without Steel Backing

French patent (No. 809,617) has been issued to Rolls-Royce, Ltd., Derby, England, for an improvement in bearing metals. It is pointed out in the specification that bearing alloys composed of an eutectic of aluminum with a proportion of not less than 8 per cent of a low-melting-point element (tin or tin-antimony) are already known. The Rolls-Royce invention aims to provide a bearing alloy which can be used without a steel backing and which will stand up under severe conditions, even on a hardened steel shaft. It is said to be especially suited for use in the main bearings of large, high-speed internal combustion engines.

The low-melting-point constituent may range between 1.5 and 8 per cent and may consist either of tin alone or up to one-third of antimony. The alloy may also contain zinc, cadmium, lead and bismuth, or a combination of these elements, provided the tin content is at least equal to the sum of the other elements in the low-melting-point constituent and that the alloy also contains a hardener, which may be either nickel alone or consist of not less than 50 per cent nickel and/or manganese, the remainder consisting of vanadium, cobalt, chromium, molybdenum or tungsten or any suitable combination of these; the hardening elements being present to the extent of at least 0.8 per cent but not exceeding, in combination with the iron of the alloy, 4.8 per cent. At least two-thirds of the low-melting-point constituent is to be made up of tin.

The antimony thus added is almost completely absorbed by the constituent of low melting point and strengthens the latter without making it unduly hard and brittle.

Tests for Quality Control of Aluminum Alloy Castings

Several tests to facilitate direct control of the quality of aluminum alloy castings were recently discussed by Kent R. Van Horn and Howard J. Heath, both of the Aluminum Co. of America, in a paper presented before the SAE National Aircraft Production Meeting held at Los Angeles, Calif.

The proof-load test, whereby each casting is subjected in a specific manner to a load which bears some relation to the design stress, has certain limitations which tend to restrict its extensive use. In most applications the service loads are so little known as to make difficult or impossible the definition of a proof load which could be taken as a satisfactory measure of the ability of the casting to withstand service conditions.

Expense of an elaborate set-up and the time necessary to perform the test may frequently justify selection of another form of quality inspection. While the proof-load test provides data on the properties of the casting principally in the elastic range, it gives no indication of the behavior of the casting beyond the yield range.

Radiographic methods have application to the direct examination of castings, and have the advantage of being non-destructive.

The degree of absorption of X-rays is a direct function of the density of the substance exposed to them. With

X-ray it is possible, therefore, to locate inclusions differing appreciably in density from the surrounding material. Experimental procedure consists of passing radiation through the specimen and detecting the various intensities of the emergent beam by a photographic film or fluoroscopic screen.

The present principal disadvantage of radiographic examination is the lack of experience on which to base a correlation of structure, as revealed by radiography and service life. A minor disadvantage of this type inspection of aircraft castings is cost.

The static breakdown test, although it does not provide data directly applicable to service life, inasmuch as the casting tested is completely destroyed, does give valuable information regarding design and foundry technique.

This type test necessitates construction of a fixture which will allow the loads to be applied, in a suitable testing machine, in the same direction as the service loads. The static loads may be either tension or compression or combination of the two forces.

A load marked print of the part to be tested serves as a guide in establishing the location and the size of holes by means of which the casting is securely fastened to the test fixture. Deformation or strain may be measured by means of indicators or strain gages and load-deflection curves can be plotted. This procedure permits a complete survey of the casting under the applied static load up to and including the breaking load.

Inasmuch as proof or breakdown tests represent static loading they are not necessarily a measure of the strength of the castings when subjected to vibration or impact loads. Apparently, there are only a few tests available which give an indication of the serviceability of a casting under a reversal of stress or bending. Relatively little is known about the relation of defects in microstructure, or of the breaking strength of a casting, to the endurance qualities.

A helpful criterion in predicting serviceability of a casting under a reversal of stress is the fact that, generally, the higher the tensile strength, the greater the resistance to alternating stresses. Consequently, the higher the ultimate breaking strength of a casting, the higher will be the resistance to vibrating stresses.

It appears that the effects of discontinuities on the properties of castings which are subjected to vibrating stress can best be determined by service experience because of lack of a suitable test procedure. There is sufficient information at hand to demonstrate that the omission of fillets in casting or finish machining and the presence of sharp notches on the surface have a greater effect on the resistance of a casting to fatigue than the usual casting discontinuities.

Citing the fact that the majority of aircraft casting failures brought to their attention have been the result of sudden changes in section, the authors emphasized the need for avoidance of any form of stress-raiser.

Carboloy Tipped Tool Has Long Service Life

A Carboloy tipped cutting tool has been in continuous service for seven years on a large boring mill in General Electric's Schenectady plant. It has been used for turning the outside diameter of motor and generator commutators. During the period it has been in use, it has turned out more than 800 commutators, involving 4400 mi. of cutting copper and mica alternately. While it has naturally been dressed many times, G.E. engineers estimate that it has attained only about one-half of its life.

The operation consists of rough turning the outside diameter of a commutator on the down cut at a speed of 400 ft. per min. with 1/32 in. feed. Depth of the rough cut is approximately ⅛ in. During the upward travel of the tool, it makes the finish cut at the same speed, removing 0.015 in. of copper and mica with a feed of 0.015 in.

Process Improves Corosion, Heat and Wear Resistance of Most Ferrous Metals

Corrosion, heat, and wear resistance of almost all ferrous metals are reported to be improved by "Ihrigizing," a process invented by Dr. Harry K. Ihrig and developed in the research department of the Globe Steel Tubes Co., Milwaukee, Wis. Ihrigizing is a method of driving silicon into ferrous articles to form an impregnation or case of almost any desired thickness and containing approximately 14 per cent silicon.

Automotive parts, including cylinder liners, valves, water pump shafts, gears, and pistons have been Ihrigized in substantial quantities. Ihrigized pump shafts have been adopted as standard for use in a number of different automotive engines and are being Ihrigized in regular production in the Globe Steel Tubes Co.'s plant.

According to Bulletin No. 102 issued by the company, Ihrigized articles have shown excellent resistance to dilute nitric, sulfuric, hydrochloric, phosphoric, and acetic acids in laboratory and service tests.

The standard Ihrigized case is from 0.030 in. to 0.040 in. thick on all exposed surfaces. It is said to be especially non-galling and will not seize readily when rubbed on itself or on other metals. Service tests with automotive engine cylinder liners and water pump shafts are reported to show the case to be highly resistant to wear even after months of continuous operation.

Physical properties of Ihrigized articles are listed as follows: Hardness of B Rockwell 80-85 (Brinell 148-163); about the same coefficient of heat transfer as mild steels and higher than stainless steels; tensile tests on SAE 1015 standard bars give an elastic limit approximately the same as an untreated bar, and the case does not crack in tension until the elastic limit is exceeded by several thousand pounds per square inch. The strength of an Ihrigized ½-in. bolt is lowered about 20 per cent; on bolts of larger diameter the percentage would be less.

Synthetic Primer For Use On Metal Products

Synthetic primer for use on metal products that is said to dry out of dust in 5 min. and, therefore reduce rejects due to shop dust and dirt, has been developed by Maas and Waldstein Co., Newark, N. J.

The primer is claimed to be suitable for use under air-drying lacquer-enamels or baking synthetic enamels, or as a shop coat. It air-dries, or can be force dried or baked, giving a flexible schedule ranging from two hours at 160 deg. F. to 20 min. at 275 deg. F.

Neoprene Disc Provides Resilient Connection

A molded neoprene disc is being used on all current Pratt & Whitney Aircraft engines to provide a resilient connection between the magneto shaft and the magneto drive shaft of the engine. The disc has 19 teeth on one side and 20 on the other.

Disc teeth mesh with steel gears mounted on the magneto drive shaft

of the engine and the magneto shaft. Any slight variation in alignment between shafts is taken care of by the flexibility of the connection.

Use of neoprene, du Pont's chloroprene rubber, permits direct contact of the disc with oil due to the fact that neoprene maintains its original rubber-like properties even after extended immersion periods. Neoprene is also said to resist the deteriorating effects of many chemicals, heat, ozone, and aging.

Aluminum Paint Manual Offered As Guide

A manual intended as a guide for the selection of a proper aluminum paint for different types of service and recommending directions for the most efficient methods of mixing and applying it has been published by the Aluminum Co. of America, Pittsburgh, Pa.

Among the subjects discussed in this booklet are: Characteristics of aluminum paint, such as durability, moisture resistance, reflectivity, etc.; paste and powder pigments; vehicles; testing of pigments and vehicles; methods of application; and directions for use of aluminum paint on various types of surfaces.

Additional data are supplied on general interior painting, specifications for aluminum paint vehicles, and recommendations for handling and storing Alcoa Albron paste and powder.

Sabeco Lead Bronze For Bearing Applications

Lead bronze for bearing use is being manufactured by the Fredericksen Co., Saginaw, Mich. Trade-named Sabeco, the material is furnished either in the form of ingots for use in the customer's foundry; in the form of cored or solid bars, as rough castings to the customer's specifications or patterns, and also in the form of machined castings, to specifications.

Sabeco bronze is available in four different grades. The composition is given as copper, 69-71 per cent; lead, 20-22 per cent; tin, 8.5-9.5 per cent. Grade 11 is for extra heavy unit pressures, while Grade 11HG is for applications to worm wheels, clutch-shifter shoes, etc.

Output of Magnesium Alloy Castings Rapidly Increasing

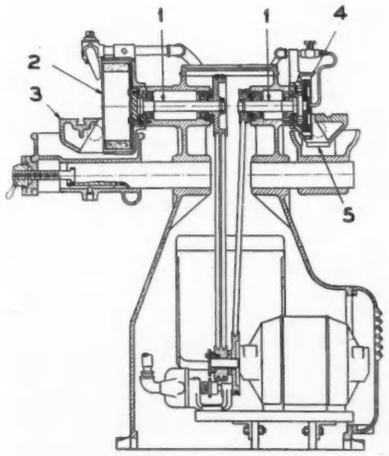
Increasing use of magnesium alloy castings in industry is succinctly expressed by production data over the period 1928-1936 which was submitted by W. G. Harvey, American Magnesium Corp., in a paper "The Manufacture, Characteristics and Uses of Magnesium Castings," which was presented recently before the SAE National Aircraft Production Meeting held at Los Angeles, Calif. The figures given by Mr. Harvey are as follows:

Year	*Pounds*
1928	55,861
1929	116,350
1930	99,443
1931	127,398
1932	132,049
1933	165,599
1934	284,419
1935	375,625
1936	791,859

TOOLS OF TOMORROW

(Continued from page 509)

the manufacturer, this distributes wheel wear evenly, promotes clean cool cutting, and maintains surface speed. A screw-feed advances the tool against the wheel. In finish grinding, the operator places the tool on the table and against a protractor, advances the cutting edge to contact lightly with the diamond-faced wheel, then slides tool and protractor back and forth as a unit under guidance of a groove in the stationary finishing table.



Sectional view of Sundstrand tool grinder.

Some of the features of this machine are indicated on the accompanying sectional view as follows: 1. Two independent heavy spindles of heat-treated chrome nickel steel which are mounted on the same center-line and run in precision anti-friction bearings protected by oil seals; 2. Rough-grinding wheel with steel back and mounted on spindle pilot. Adjustable steel guard conforms to American Engineering Safety Code, provides for 2¾ in. wheel wear. Adjustment of guard permits right-hand and left-hand grinding; 3. Rough-grinding table has trunnions in protected bearings to allow adjustments ranging from 10 deg. above horizontal to 30 deg. below; 4. Diamond-faced finishing wheel mounted on spindle pilot; 5. Finishing table hardened and ground has accurate slot for guiding protractor and grooves which facilitate tool movement and also carry away fine abrasive. The table may be clamped in any position from 10 deg. above horizontal to 30 deg. below.

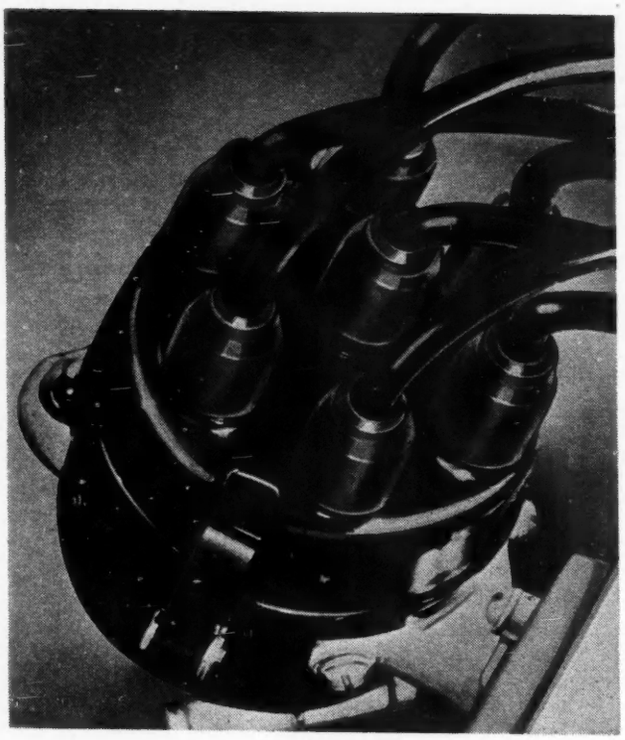
Blast Cleaning

. . . Wheelabrator has fabricated steel side frames; welded corner and joint construction.

The American Foundry Equipment Co., Mishawaka, Ind., has brought out a new model 36 in. by 42 in. Wheelabrator Tum-Blast. Among the features incorporated into the design of this centrifugal abrasive blast cleaning equipment are fabricated steel side frames which replace cast iron frames formerly used, and welded corner and joint construction.

An improved suction type abrasive separator is included at the elevator head as standard equipment on the new model. As stated by the manufacturer, the separator keeps the abrasive clean by removing forging scale and other foreign material is extracted by the rotary screen.

The machine, equipped with the standard conveyor, will clean metal parts weighing up to 30 lb. Pieces weighing as much as 75 lb. can also be cleaned when the machine is equipped with a heavy-duty conveyor.



High-tension cables of the ignition system are protected from moisture by tight-fitting caps.

New clutch baffle and release bearing, engine impulse neutralizer, generator, brake drums, muffler, seat adjustment, fender mountings and headlamps are among the . . .

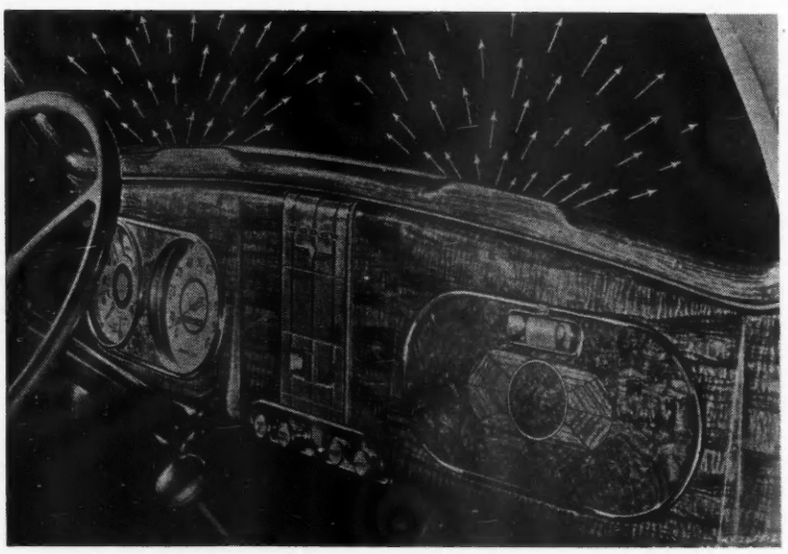
Forty-seven Refinements T

DODGE again offers a single line of cars carrying a six-cylinder powerplant but available in two wheelbase lengths and with a choice of ten body styles. Coupes come in three styles, business, rumble-seat, and convertible; sedan and touring sedan models include two- and four-door closed types and a convertible style. All of these are mounted on a chassis of 115-in. wheelbase. There are also two seven-passenger models, a sedan and a limousine, on a chassis of 132-in wheelbase.

While no radical changes have been made in either body or chassis design, improvements made to enhance the appearance, comfort or performance total no less than 47. Entirely new are the radiator shell and grille, and new features are embodied also in the hood louvers, fenders and their mountings, windshield, instrument panel, seat adjustment, head lamps, door and luggage compartment locks, brake drums, engine impulse neutralizer, muffler, clutch facings, clutch baffle and release bearings, generator and interior treatment.

The front-seat adjusting lever now is located on the left side, where it can be conveniently reached. As the front seat moves forward it also rises, thus bringing short drivers closer to the control pedals and into a higher position, where they have a better view of the road ahead. Other interior features include tilting foot rests in the rear compartment, high-power dome lights in the rear body panels, defrosting outlets in the instrument panels, deep floor carpets, and smoothly trimmed side walls and roof.

In redesigning the instrument panels the engineers aimed at safety and con-



All instruments are directly in front of the driver. The arrows indicate the flow of heated air from the defroster outlets.

venience. The heat indicator, ammeter dial, fuel and oil gages are grouped in a circle and placed beside the speedometer, so that the driver, in reading the instruments, need not turn his eyes from the direction in which the car is traveling. Switches, control knobs, glove compartment, ash-tray handles and ignition lock are sunk into the instrument panel, which is thus freed of projecting parts.

Silencing of the bodies has been carried a step further. The steel roof, the rear quarters, and the cowl are insulated with heavy padding. Body sides that assist in keeping the clutch cool and in breaking a vacuum that might affect the rapidity of clutch action. Minor improvements have been made in the Dodge synchro-silent three-speed transmission. The parking brake is now applied and released by a "pistol-grip" lever located in the center of the instrument panel.

The diameter of the cast-iron brake drums has been increased from 10 to 11 in. Front-brake drums are now more accurately balanced. Night-driving safety is enhanced by improvements in the lighting system. The headlamps supply a main beam for open-road travel and also a courtesy or passing beam. Both beams are produced by 32-c.p. bulbs, but while the main or driving beam points straight ahead, the courtesy beam is deflected far enough to the right to give a clear definition of the road shoulder. Instrument-panel lighting is indirect, the face of the cover glass throwing the light on the controls and indicators.

Body ventilation is regulated by means of pivoted ventilators, a screen-protected variable cowl ventilator, and crank-controlled windows.

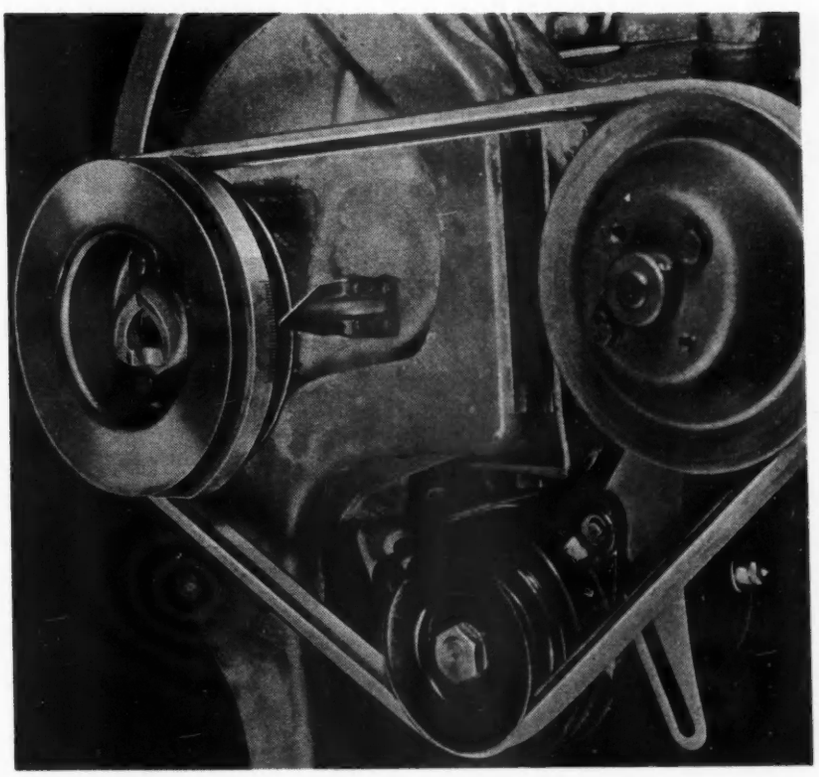
That Mark the 1938 Dodge Line

and door panels are covered with a plastic material that is cemented to the metal surfaces. A gum-like substance is sprayed on the under side of rear-deck lids, which latter are formed of two metal panels with padding between them.

Dodge bodies are mounted on outriggers on the frame through the intermediary of spool-shaped rubber cushions, which feature further contributes to the silent operation of the cars.

The engine is a six-cylinder L-head of 3¼-in. bore by 4⅜-in. stroke. Engine features like the full-length water jackets, steel valve inserts, pressure lubrication, aluminum pistons, automatic choke and spark advance are continued, some in modified form. The modifications include such details as a new spool-shaped support in the "floating-power" engine mounting, a rubber-cushioned impulse neutralizer, an exhaust silencer of new construction, and a new-type compression ring in the pistons.

Several improvements have been made in the clutch mechanism. The release bearing is larger and its self-lubricating capacity greater. The driven clutch disk has a baffle preventing oil from reaching the friction disks. The clutch facings are provided with grooves



Dodge cars now have a rubber-type vibration damper

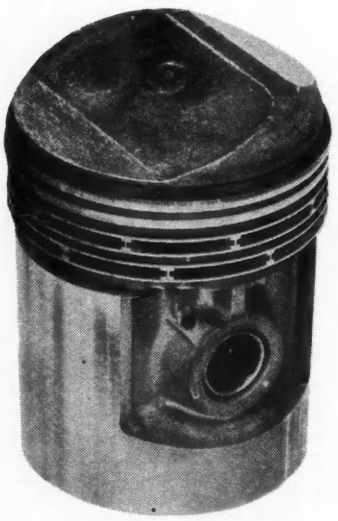
Buick Has New Spring Suspension fo

By Joseph Geschelin

Domed piston head increases output of powerplant in the new models.

THREE basic engineering changes feature the 1938 Buick line, namely, rear suspension on coil springs, a novel form of combustion chamber dependent on sloping surfaces of the piston crown, and a new body mounting designed to prevent the transmission of road shocks. These features are embodied in all of the models in the line. In addition, Buick offers the Model 40 with the self-shifting transmission that was described in Automotive Industries of May 29 last, as an option installed at the factory.

The Buick 1938 line comprises the Series 40 on a 122-in. wheelbase, Series 60 on a 126-in. wheelbase, Series 80 on a 133-in. wheelbase and Series 90 on a 140-in. wheelbase. The 80 and 90 wheelbases are 2 in. longer than last year, a change which was prompted by the adoption of the new rear springing. The 40 and 60 continue the hypoid gearset of last year, except for the use of Hyatt spherical roller bearings at the sides of the differential. Hypoids are now used also on the 80 and 90. On the 40 and 60 the bodies remain the same, while the 80 and 90 have new bodies designed on the lines of those offered on the smaller chassis. The front-end styling has been altered to some extent, by the use of two die-cast radiator-grille frames giving a straight up-and-down radiator-grille profile.



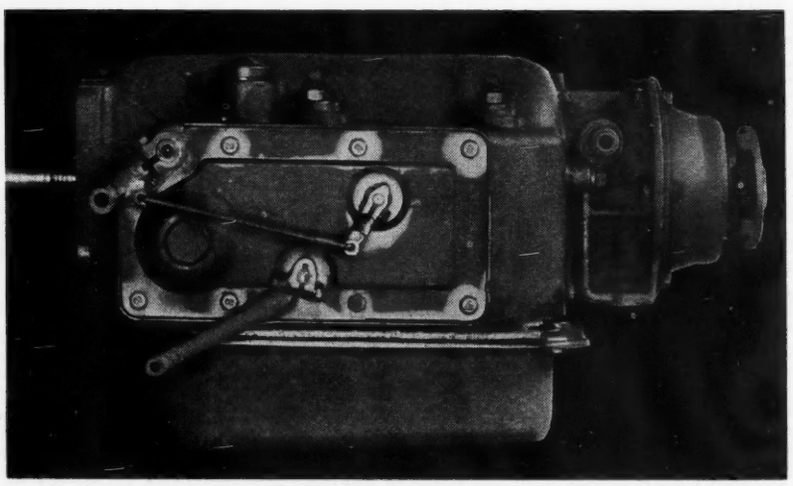
Detail of domed piston

Bodies for the 80 and 90 are roomier but weigh very little more than last year. Front seats are 2 in. wider, door openings also are wider, and the windshield openings have been increased about 1⅜ in., for better visibility. The rear seat has a folding center arm rest. Front-seat backs on all models have been improved by a form-fitting contour which supports the occupants back.

In all-around performance the new models show great improvement. On the 40 and 60 the steering linkage has been changed to produce better steering and less critical wheel alignment. With coil springs at all four corners, the cars are said to be more stable and to afford greater safety under varied road conditions.

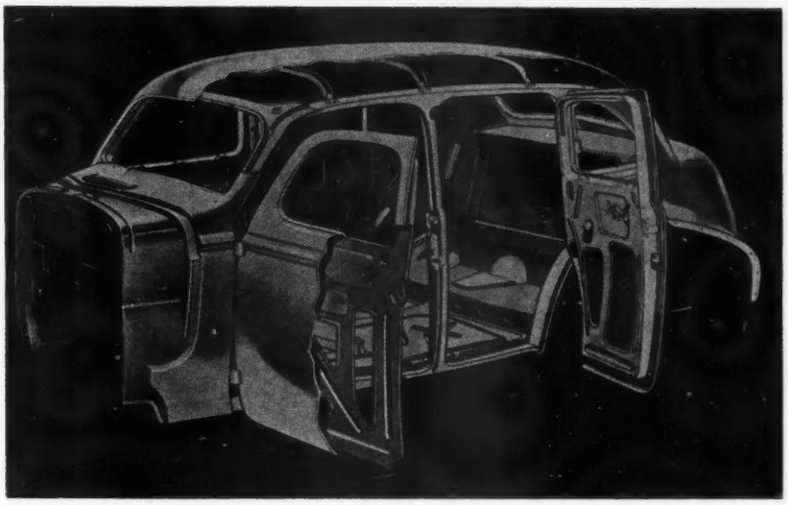
Except for changes which will be pointed out, the principal mechanical components, such as the engine, transmission, clutch, axle and torque tube, remain the same. Frames are new, with straight side rails and new X members built up of channel sections instead of the I sections used last year. By the adoption of coil springs at the rear, Buick has eliminated eight lubrication points at the rear on all models, and on the 40 and 60 four more were eliminated at the front by the adoption of the new steering hook-up.

The throttle linkage has been simplified and is "insulated" at the pedal by means of an oblong piece of rubber-impregnated fabric. Engine starting is effected by means of the accelerator pedal. By the provision of an "over-



External view of self-shifting transmission (which is optional on the Buick 40)

for 1938



General view new all-steel body cut away to show details of construction and insulation

center" pedal-return-spring hook-up, the pressure required to depress the clutch pedal has been decreased further.

Transmissions remain the same, but on the Series 40 the synchronizers now are of two-lobe instead of three-lobe design, and they have hexagonal retaining springs instead of the detent springs used last year.

Front-end sheet-metal changes include the use of fixed hood sides with a hinged lid to provide access for ordinary service operations. This stiffens the front end sufficiently to make possible the elimination of the customary radiator braces. Front fenders are mounted independently of the frame and are "insulated" so as to prevent the transfer of road shocks and weave.

New Buick rear suspension

A new zinc die casting has been designed to produce a combination rear license lamp and rear-deck handle and lock unit.

The concentric-bowl carburetor developed by Bendix is continued, but it now maintains an idling-jet action at all speeds, thus eliminating the momentary surge or roughness under certain conditions in the transition from idling to power jet. New Marvel carburetors having similar characteristics also will be used. Service engineers will be interested in the fact that valve grinding has been eliminated as a primary factory operation by proportioning the slope of the valve seat and valve head so as to seat properly during the initial break-in period.

Defrosters have been improved by placing the outlet in the windshield garnish molding so that the heated air stream impinges directly on the glass without any deflecting action.

The battery is mounted under the hood on the hood ledge, with a baffle wall which scoops air at the front and sweeps it around the battery for ventilation and cooling. It consists of a Delco end-to-end cell assembly with bedded connectors.

Rear-axle ratios are as follows:

Series 40	4.444 to 1.
Series 60	3.900 to 1.
Series 80	4.181 to 1.
Series 90	4.555 to 1.

As may be seen from the drawing and specifications, engines remain the same but their performance is quite different, due to improved combustion chamber design, the improvement resulting from a domed piston crown. This, in combination with an increased compression ratio, has increased the power output some seven per cent on the 40 and eight per cent on the 60. Pistons are of aluminum alloy, anodized, as previously.

All engines are of the eight-cylinder valve-in-head type. The Series 40 engine has a bore of 3 3/32 in. and a stroke of 4⅛ in. (248 cu. in.); it is rated 107 hp. at 3400 r.p.m. Last year the rating was 100 hp. at 3200 r.p.m. Its compression ratio has been raised from 5.7 to 6.15.

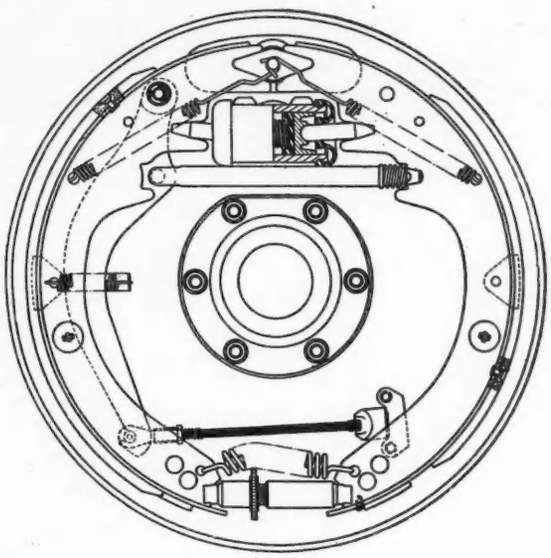
Series 60 engine has a bore of 3 7/16 in. and a stroke of 4 5/16 in. (320 cu. in.) and is rated 141 hp. at 3600 r.p.m. (as compared with 130 hp. at 3400 r.p.m.). Its compression ratio has been increased from 5.9 to 6.35.

Engine control has been simplified by combining the automatic choke control with the vacuum-controlled starter switch. All engine bearings now are made from special lead-babbitt alloy. The generator is now mounted on a rigid bracket on the side of the water jacket.

Spring suspension on all models com-

prises four coil springs, with knee-action at the front but a conventional axle at the rear. The two rear coil springs are mounted in a spring seat on the axle housing behind the axle, thus increasing the spring base by some 5 in. Delco direct-acting, low-pressure shock absorbers are used at the rear. With coil springs, Buick retains the torque-tube drive, using a heavier torque tube and, in addition, a radius rod extending diagonally from a bracket on the right hand side of the axle housing to a bracket on the frame. The radius rod is made by welding and hydrogen-brazing two stampings into the form of a strong rectangular section. The ends are pivoted in rubber bushings.

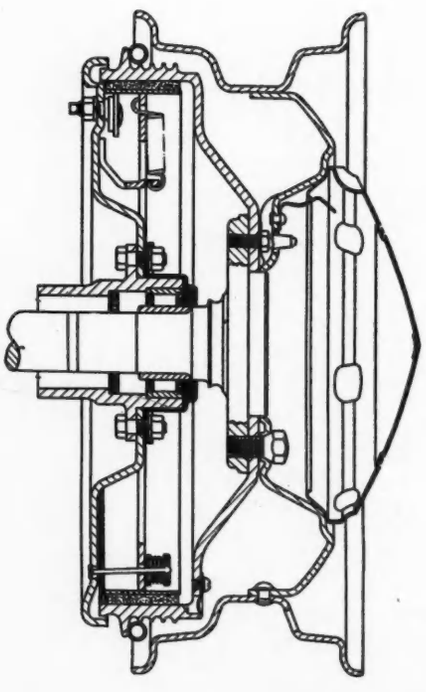
It is claimed by Buick engineers that the new suspension gives all of the desirable features of rear independent springing without its mechanical complications and disadvantages. The back-

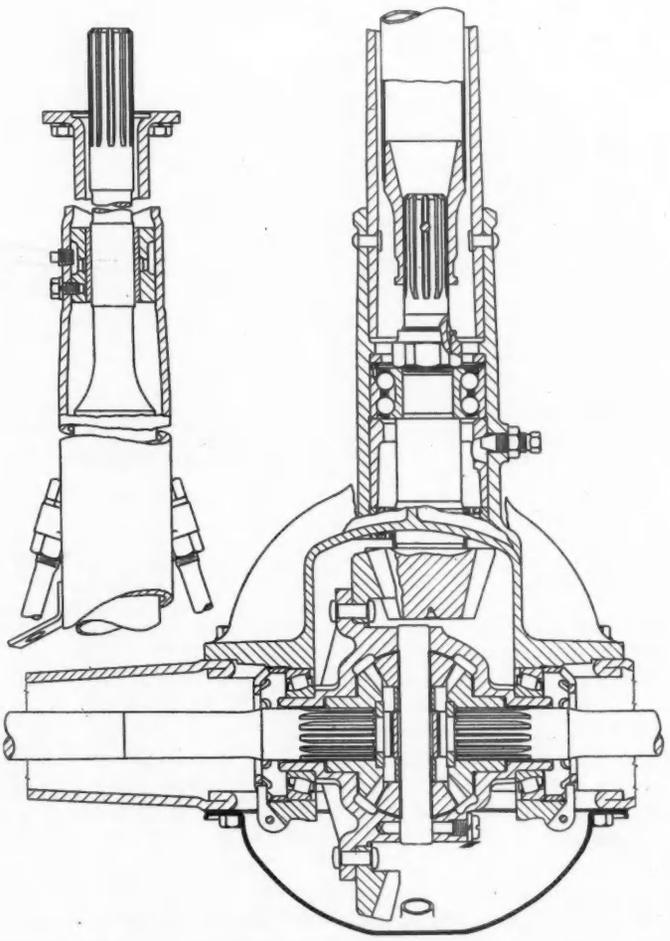


Engineering Details of 1938 Buick Rear Axle Assembly

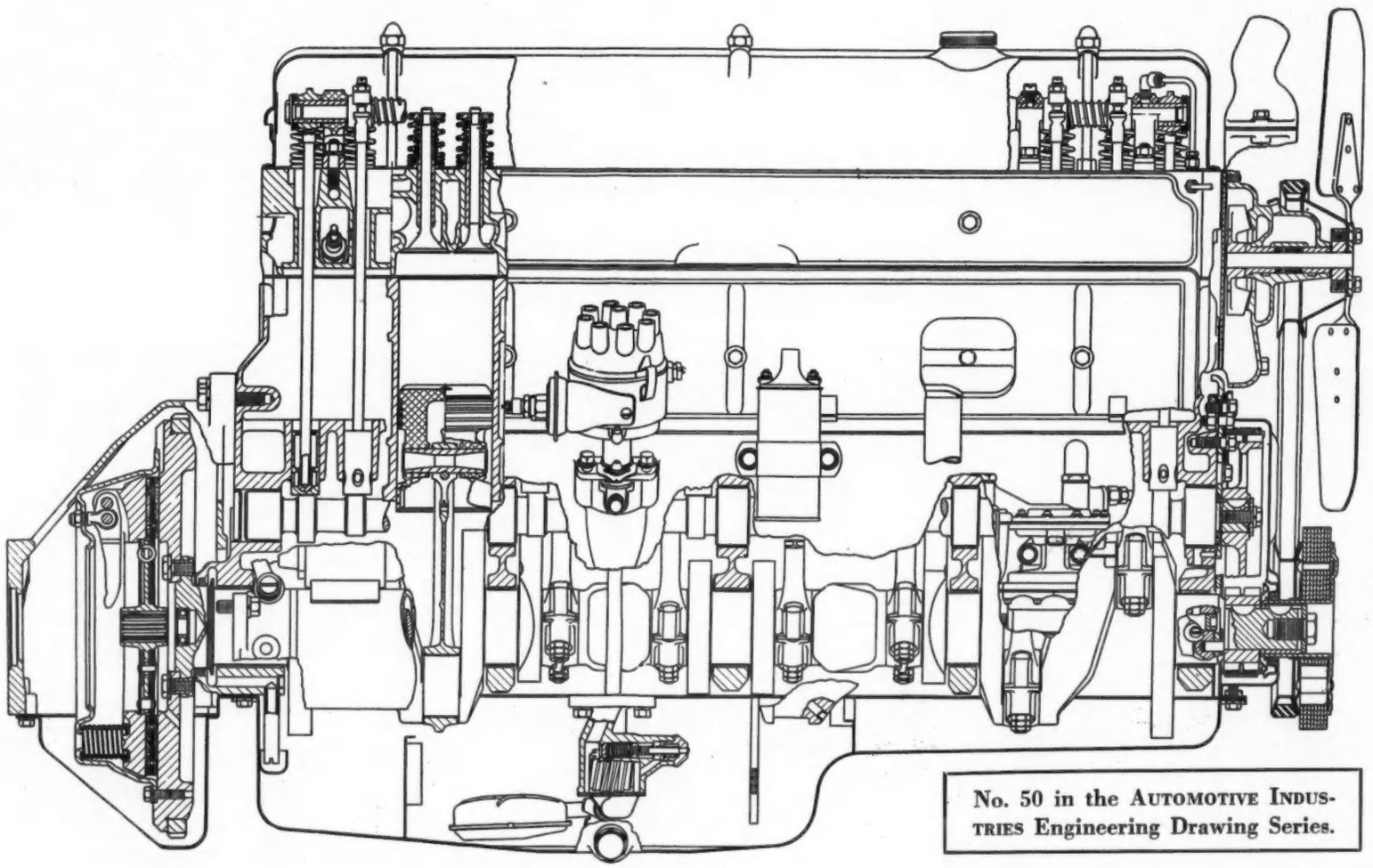
(Left, top and bottom), Details of construction of brake assembly on 1938 Buick, model 90

(Below), Sectional view of hypoid rear axle standard on 1938 Buick, model 90. The 40 and 60 models continue the hypoid gearset of last year, except for the use of Hyatt spherical roller bearings at the sides of the differential. Hypoids are now used also on the model 80.



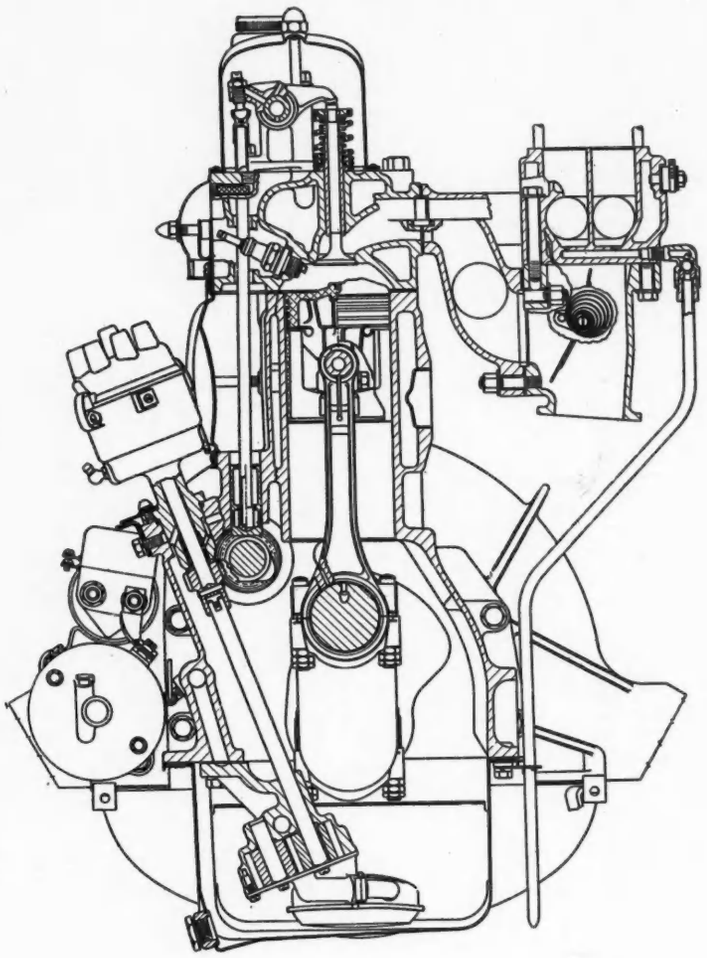


1938 BUICK . . . . *8-cylinder, valve-in-head engine manufactured by the Buick Motor Division of General Motors Corp., Flint, Mich.*



No. 50 in the AUTOMOTIVE INDUSTRIES Engineering Drawing Series.

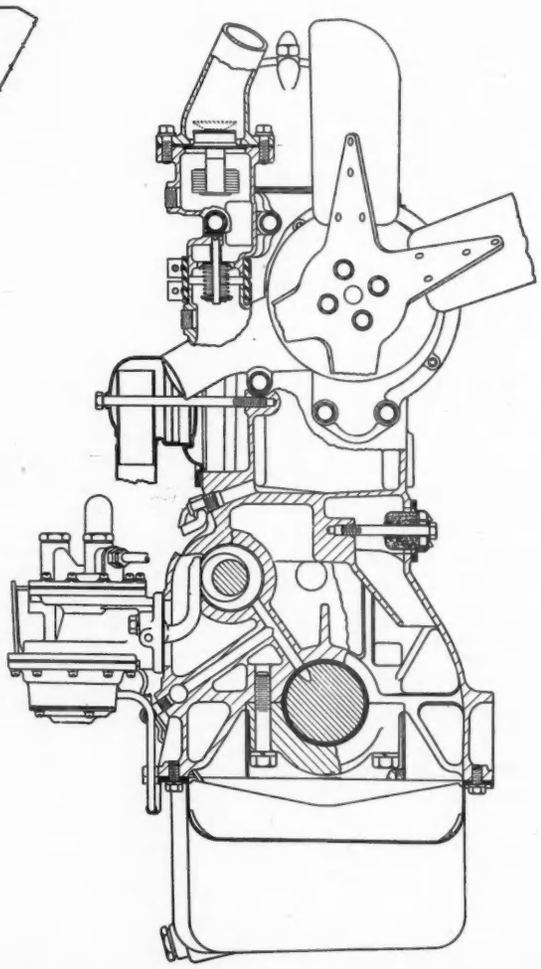
1938 BUICK . . .



The vibration dampener used on the crankshaft consists of a laminated steel flywheel supported on steel leaf springs. There are eight counterweights on the crankshaft. Main bearings are of steel-backed Babbitt.

Lubricating oil is supplied under pressure to the main bearings, the connecting rods, the camshaft bearings, and the rocker arms.

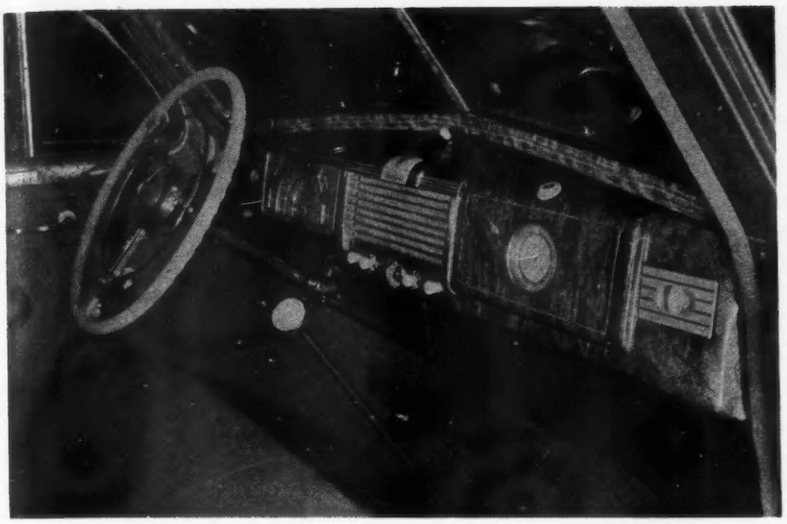
The firing order is: 1-6-2-5-8-3-7-4.



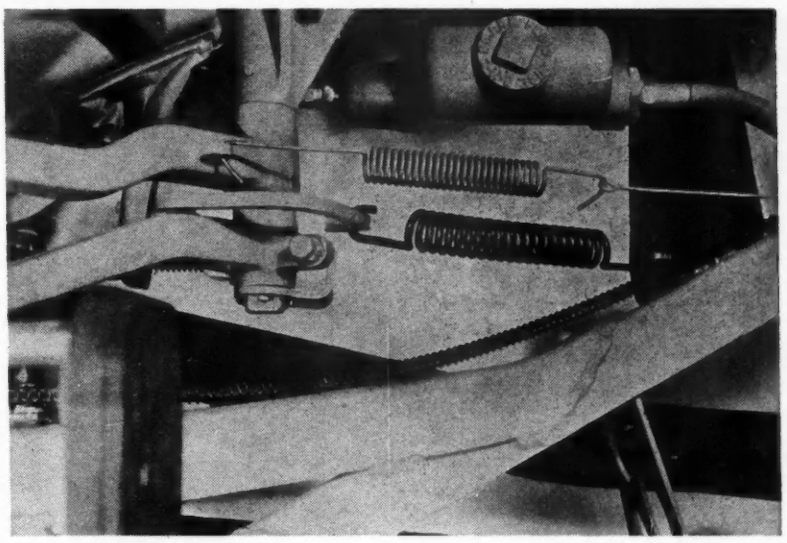
This 8-cylinder, valve-in-head engine has a bore of 3 7/16 in. and stroke of 4 5/16 in., making the piston displacement, 320.2 cu. in. It is rated 141 b.hp. at 3600 r.p.m. Maximum torque developed is 269 lb.-ft. at 2000 r.p.m. Standard compression ratio is 6.35 to 1.

The Lo-Ex alloy pistons have a domed-shaped crown, providing a novel form of combustion chamber. They carry two 3/16-in. oil rings and two compression rings, the upper being ⅛ in. thick; the lower, 3/32 in.

Connecting rods are made of hot-rolled steel (H.R.S. 1045) and measure 8¼ in. center to center.



Interior view showing series 40 instrument panel treatment, with radio installation optional and electric clock



Over-center clutch spring linkage

seat ride is measurably improved over all kinds of roads, and the new cars have unusual stability on the road in severe maneuvering. Unsprung weight is reduced by the simplification of rear-end elements.

With improvement in suspension, it has been possible to effect further improvement in steering on the 40 and 60. The steering geometry has been altered by eliminating the transfer arm used last year and devising a "direct cross steering" hook-up in which the motion is transmitted directly from the pitman arm to a long tie-rod extending to the right-hand steering knuckle. A short tie-rod is attached to the long rod, slightly to the right of the point where the pitman arm connects. The steering hook-up on the 80 and 90 remains the same as used on the models of last year.

This year Buick has gone back to the straight side-rail frame, and bodies on all models are mounted on outriggers on the side rails. On the 40 and 60, only three pairs of mounting brackets are used ahead of the rear axle kick-up, the first pair being directly under the dash panel. The first pair is bolted solidly to the body sill, the other two pairs are completely "insulated" in rubber. The novel feature of the mounting is that in order to protect the body from frame distortion at the rear, it is mounted at the center of the rear cross-member, in rubber.

As the frame ends are permitted to weave without restraint (within predetermined limits), the fuel-tank filler is frame-mounted and entirely free of the body structure and the rear fender. It is reached through a small rectangular door in the rear fender.

Body mountings on the 80 and 90 are similar to those on the 40 and 60, except that there are five sets of mounting brackets ahead of the rear kick-up, and two insulated center mountings at the rear, one on each of the two rear cross-members.

Buick 1938 Models

Series 40—122-in. Wheelbase

5p. 2d. streamline sport sedan	
5p. 2d. touring sedan	Trunk Back
5p. 4d. streamline sport sedan	
5p. 4d. touring sedan	Trunk Back
2p. business coupe	Plain Back
4p. sport coupe	Opera Seats
4p. convertible coupe	Rumble Seat
5p. conv. streamline sport phaeton	

Series 60—126-in. Wheelbase

5p. 2d. touring sedan	Trunk Back
5p. 4d. streamline sport sedan	
5p. 4d. touring sedan	Trunk Back
4p. sport coupe	Opera Seats
4p. convertible coupe	Rumble Seat
5p. conv. streamline sport phaeton	

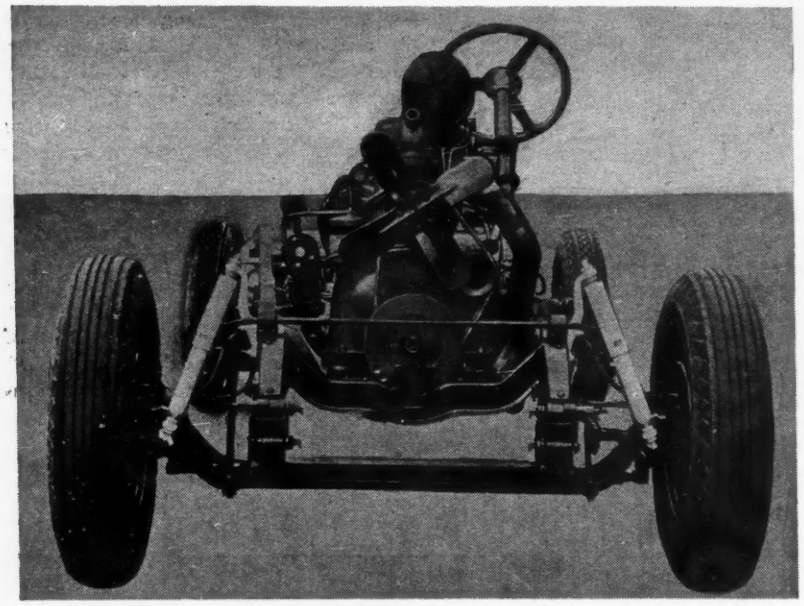
Series 80—133-in. Wheelbase

6p. 4d. streamline sport phaeton	
6p. 4d. touring sedan	Trunk Back
6p. 4d. streamline sport sedan	
6p. 4d. formal sedan	Trunk Back

Series 90—140-in. Wheelbase

8p. 4d. touring sedan	Trunk Back
8p. limousine	Trunk Back
6p. 4d. touring sedan	Trunk Back

Five wheels are standard equipment on the Series 40, 60, and 80. Six wheels and fender wells are standard equipment on the Series 90.



Double-acting, hydraulic shock absorbers arranged "Sea-legs" fashion will be standard equipment on all 1938 Nash cars.

Three Nash Series O

AN air-conditioning system for winter driving tops the list of new developments offered in the 1938 Nash cars. Other features stressed by Nash Motors Division of Nash-Kelvinator Corp., Kenosha, Wis., include redesigned engines for the Ambassador Six and Eight series, with intake and exhaust lines cast in the block; a new shock absorber arrangement, a vacuum-operated gear shift actuated by a small lever extending from the center of the instrument panel, a new sound-proofing method, and more roomy interiors.

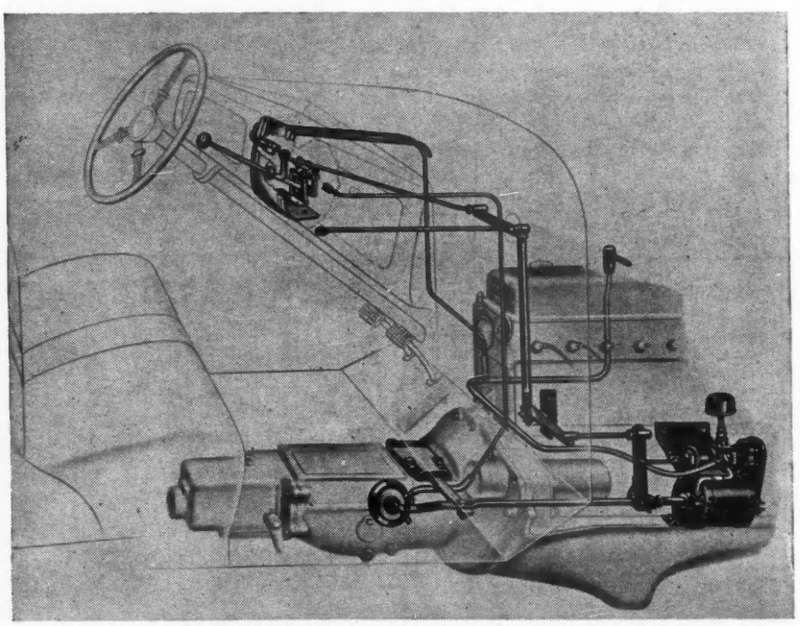
The three series of cars made by Nash are the Ambassador Eight, the Ambassador Six, and the LaFayette. The Ambassador Eight is available in five body styles and has a wheelbase of 125 in. Body styles of this line include a four-door sedan with trunk, a Victoria two-door sedan with trunk, an all-purpose five-passenger coupe, a business coupe, and a cabriolet (convertible coupe). The Nash Ambassador Six, with 121 in. wheelbase, is available in the same five body styles.

The LaFayette line, with 117 in. wheelbase, is offered in both DeLuxe and Master series. The DeLuxe group includes five body styles, the same as those of the Ambassador lines, while the Master group has four, the cabriolet being eliminated from this line.

All cars of the various Nash lines will be supplied in any of seven standard colors, viz., black, Mohawk maroon, Cascade blue, Golden beige, Empire green, and Lido gray.

The air-conditioning system consists of a unit containing an air filter, a motor-driven fan, and a hot-water heating element. This assembly is mounted under the cowl and is connected with the cowl ventilator. During wet weather most of the moisture in the air is removed by an arrangement in the air intake duct. Air is forced through the cowl ventilator at a rate depending on car speed, the volume being controllable by adjustment of the ventilator.

After the moisture (if any) has been "spun" out and carried off through a vent pipe provided for the purpose, the air is introduced into the conditioning unit through the filter. From the filter, air under pressure travels past the motor-driven fan, through the hot-water heating element, and into the interior of the car. The purpose of the fan is to maintain a flow of cleaned, warm air into the car when at rest or travelling at low speed. It also keeps the air pressure approximately constant when the vehicle is moving at high speeds.



Diagrammatic detail view of vacuum gear-shifting system offered as optional equipment on the new models.

Air-Conditioning System Tops 1938 Nash Offerings. Other Innovations Include: Redesigned Ambassador Six and Eight Engines; New Shock Absorber Arrangement; Vacuum Operated Gear Shift; Emphasis on Quieter Operation and Roomy Interiors.

Offered for 1938

With the system in operation, the air pressure within the car is always slightly greater than atmospheric, hence the direction of air flow is at all times outward, even though doors and windows are closed. At a speed of 30 m.p.h. air is taken into the body at the rate of about 300 cu. ft. per min. Because of this rapid change, the air within the car never becomes stale and contaminated with dangerous monoxide. Besides, window and windshield steaming and fogging are eliminated.

The new Nash "Super-thrift" engines, which are of simplified design, are claimed to produce 10 per cent more power, give 12 per cent more gasoline mileage, and have unusually low maintenance costs. These new engines embody the same principles of design as the "Monitor-Sealed" model which has been used in the LaFayette Series for the last three years. The Ambassador eight-cylinder engine is of the valve-in-head, twin-ignition, double-carburetion type, with a rating of 115 hp. The Ambassador six-cylinder powerplant is rated 105 hp. and is of the valve-in-head, twin-ignition type. The LaFayette L-head engine has a rating of 95 hp. All engines develop more power than those used in the 1937 models.

In the "Iso-Thermal" fuel intake system, the inlet manifold—located inside of the cylinder block on the LaFayette Series and inside the cylinder head on the two Ambassador Series—is heated over its entire length by water in the cooling system. The purpose of this arrangement is to keep the temperature of the intake system within a narrow range, to improve both performance and economy.

All 1938 Nash cars will have double-acting, hydraulic shock absorbers.

The operating lever of the vacuum gear-shift extends from the instrument panel to within a few inches of the right-hand position on the steering wheel. The vacuum gearshift, like the air-conditioning system, is optional equipment.

The air-conditioning unit introduced by Nash which will be available as optional equipment

Another new feature of the latest Nash models, a method of sound-proofing which is claimed to make these cars 25 per cent more quiet than their predecessors, was developed in collaboration with engineers of the Kelvinator Division of Nash-Kelvinator Corp. It was found that the under-panel of an automobile is the principal source of vibrations causing objectionable sound waves. Sand, it was discovered, damps out audible frequencies very effectively, and a compound was developed with which Nash cars are now sound-proofed.

By moving the engine forward 3 in., for the sake of a better weight distribution, greater leg room was obtained incidentally. This modification, coupled with a slightly changed arrangement of the bulkhead, added 2½ in. of leg room in the front compartment and 2 in. in the rear compartment. Front and rear measurements can be varied by adjustment of the driver's seat.

An automatic overdrive, which goes into operation at 40 m.p.h., greatly reduces the engine speed at the higher car speeds. It is an optional feature. A new automatic hill-locking device named the "NoRol" prevents the cars from coasting backward when stopped for any reason on hills.

The Nash bed arrangement is again provided on the four-door sedan in each series.

The hood of the LaFayette Series is approximately 4 in. longer, making it the same length as the 1937 Ambassador Six hood. Similarly, the Ambassador Six hood is 4 in. longer than it was in 1937, or the same length as the hood of last year's Ambassador Eight. The Ambassador Eight hood for 1938 has been increased in length the same amount.

The rear end has been lowered 1 in. This was made possible by the development of an improved method of fastening the body to the chassis. Road clearance is not affected, nor is the roof-to-floor measurement.

The instrument panel in each series is trimmed in Tenite, a molded plastic material. Much of the other interior trim is also made of Tenite.

In addition to improved sound-proofing, many other body refinements have been incorporated in the new designs. The trunk shelf in the rear compartment is mounted on steel girders, welded to the body frame, rather than on wood supports. A double-lipped rubber seal is used in all trunk covers. Further quieting is achieved by placing rubber seals around the doors and by improvement of the door locks. A rubber sealing compound is sprayed on all body joints to seal the bodies against dust, dirt, grime and moisture.

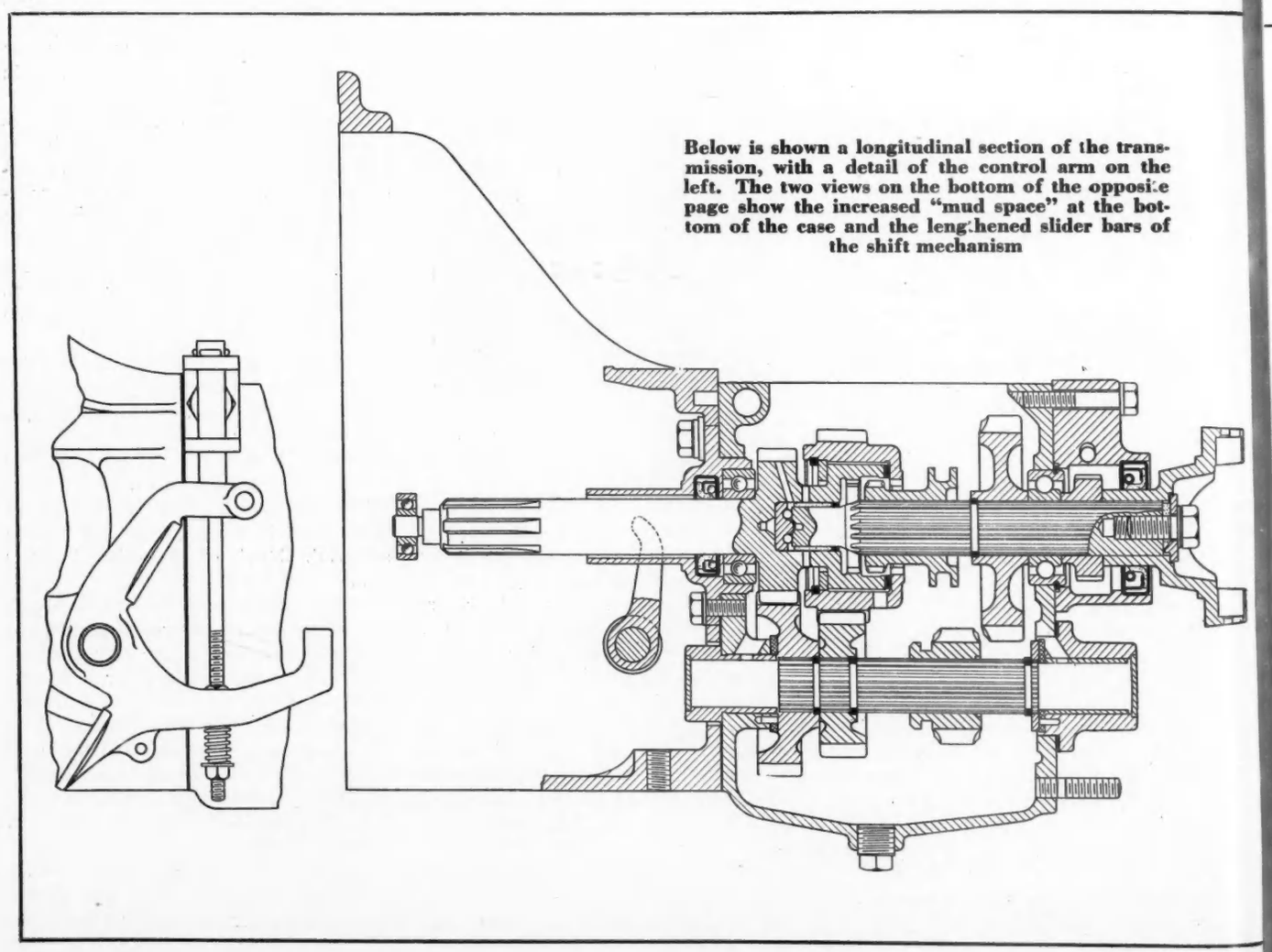
Hudson Models Are Newly Styled fo

HUDSON MOTOR CAR COMPANY'S 1938 line consists of an eight-cylinder car made in both 122- and 129-in. wheelbase, a Six with a 122-in. wheelbase, and the Hudson Terraplane, with a 117-in. wheelbase. These three chassis are fitted with bodies that are 55 in. wide in the front compartment (the same as last year) and have 2 in. additional inside length, this gain in length being due to a redesign of the front compartment. The 2 in. additional length is made use of to increase the rear-compartment leg room.

The new cars differ from their predecessors in both outside and inside appearance. A new treatment has been given the radiator grille, and a two-tone upholstery and trim design, in combination with new garnish moldings, some of them chromium-finished, give a modernistic effect that harmonizes with the exterior lines.

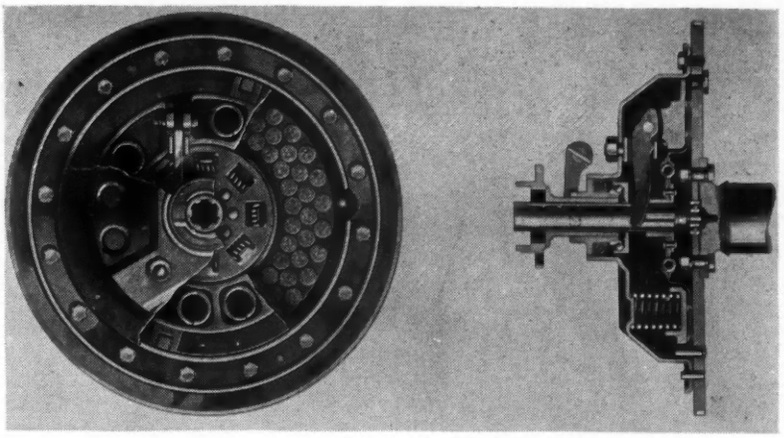
Improvements have been made in the selective automatic shift transmission, the electro-vacuum unit which has been offered by Hudson as an option for a number of years. For instance, if upon attempting to shift into low-forward or reverse gear, the gears should butt, the selector lever will automatically return to neutral, thus calling the attention of the driver to the fact that the gear has not been engaged. Another improvement is in the design of the clutch-operated circuit breaker, whose function it is to assure that the shift takes place only when the clutch is disengaged. The automatic clutch action which takes place in connection with the gear shift, has been improved by the provision of a balanced vacuum cylinder. This is said to make it possible to creep backward or forward, as required when maneuvering into relatively narrow parking spaces. Formerly a pendulum device was used for this purpose, but this has now been replaced by the vacuum cylinder. As previously, the free-wheeling action of the automatic clutch is eliminated at speeds above 18-20 m.p.h.

On the Hudson Terraplane deluxe model a single-throat, manual-choke carburetor is used. The metering of this carburetor is controlled by a metering pin which was formerly connected to the accelerator pedal, while now the position of the pin is controlled by the



Below is shown a longitudinal section of the transmission, with a detail of the control arm on the left. The two views on the bottom of the opposite page show the increased "mud space" at the bottom of the case and the lengthened slider bars of the shift mechanism

for 1938



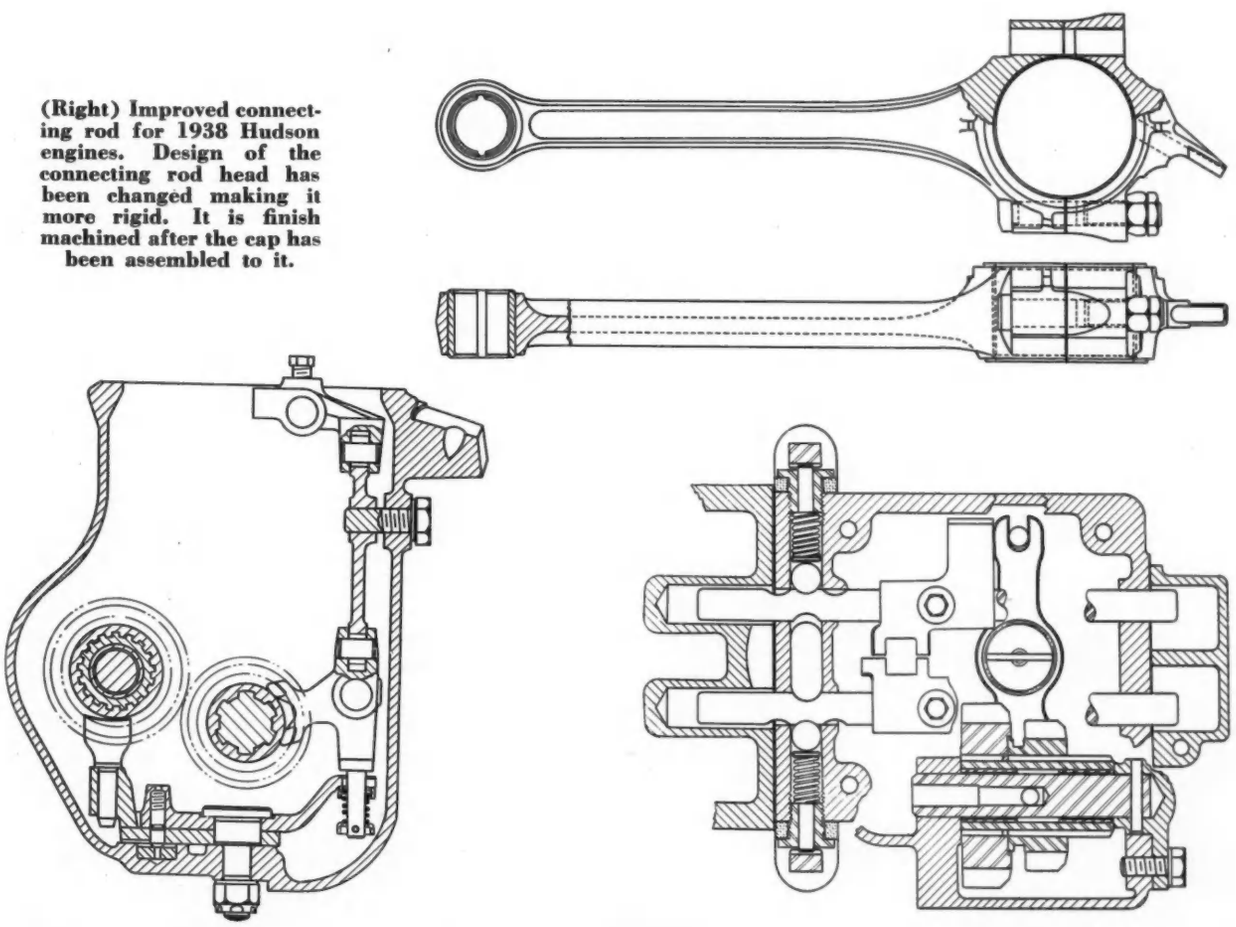
Clutches on all 1938 Hudson models have been enlarged and carry three additional springs which are nested in three of the regular springs. Torsion-damper springs on all clutches have been made stiffer, the clutch discs are now cupped.

manifold vacuum. This is said to assure more accurate metering and to make it possible to run on leaner mixtures, thus making for better economy. Besides, it improves cold-weather starting. All other Hudson models carry dual-throat carburetors, and in these an improvement in the automatic choke is said to have made stalling impossible.

The Hudson eight-cylinder engine (3-in. bore, 4½-in. stroke, 254-cu. in. displacement) operates with a compression ratio of 6.25 and is rated 122 hp. at 4200 r.p.m. The six-cylinder engine (3-in. bore, 5-in. stroke, 212-cu. in. displacement) as installed in the Hudson Six, has a compression ratio of 6.25 and is rated 101 hp. at 4000 r.p.m. When provided with a special cylinder head with a compression ratio of 7, the rating is 107 hp. As installed on the Hudson-Terraplane, with single-throat carburetor, the rating is 96 hp. at 3900 r.p.m.

Certain changes have been made in the design of the connecting-rod head, which is now more rigid, and, besides, it is machined to a finish after the cap has been assembled to it. The weight of the vibration damper on the engine crankshaft has been reduced and this is said to have minimized synchronous

(Right) Improved connecting rod for 1938 Hudson engines. Design of the connecting rod head has been changed making it more rigid. It is finish machined after the cap has been assembled to it.



IF YOU HEAT TREAT STEEL

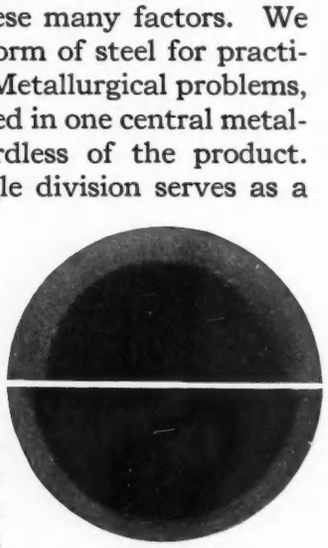
...let a Bethlehem metallurgist steer you through this labyrinth

A maze of variables faces the plant which heat treats steel: Different types of treatment, steels with radically different properties, mechanical details such as heating and immersion.

Bethlehem has had unusual opportunity to study and evaluate these many factors. We make virtually every form of steel for practically every industry. Metallurgical problems, as they arise, are handled in one central metallurgical division, regardless of the product. Consequently this single division serves as a powerful lens, focusing on each particular problem all of the knowledge acquired in contacting every type of steel user.

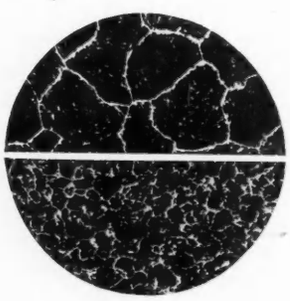
As a result, Bethlehem is in an exceptional position to assist you. We are featuring heat treating at our National Metal Show exhibit. We have devoted many pages of our Alloy Steel Handbook to helpful information. Above all, we place at your service our entire metallurgical staff—to help you select steel, to determine the best heat-treating cycle for your particular job and to assist in placing it in operation.

Where should you use the P-F test?



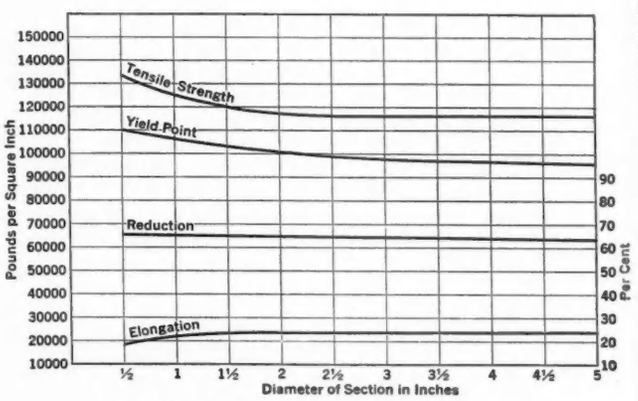
The P-F (Penetration-Fracture) test is used to check the depth to which a steel will harden when heat treated—a characteristic not entirely dependent on chemical analysis. This test is sometimes included in specifications for tool steels and other steels which are intended to be heat treated during processing.

Which grain size?



Coarse-grain steels harden deeper, machine more readily. Fine-grain steels will machine to a better surface, are distorted less in heat treatment, stand shock better. For best results in any application it is necessary to strike a balance between these factors.

What is the effect of size of parts?



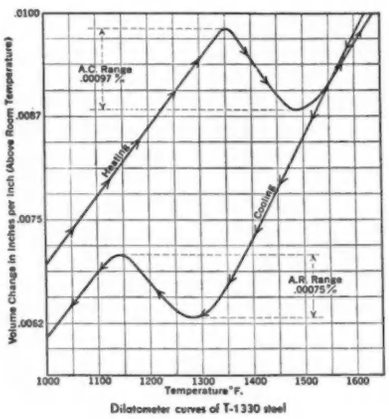
S. A. E. 3240, oil quenched at 1500° F., drawn at 1200° F.

As parts increase in size heat treating becomes more complex, on account of decreased effectiveness of the cooling medium and the development of internal stresses. The size of the part will to some extent influence the selection of steel, as well as the details of the heating and quenching. Also, as size increases, greater care must be exercised in handling the steel.

What about handling during quenching?

Even such an apparently trivial detail as immersion in the quenching medium must be handled with consideration of many factors. For example, if gas bubbles are permitted to cling to the surface, uneven quenching may result. The exact method of handling will depend on the shape of the piece.

Where is the danger in heating?



Dilatometer curves of T-1330 steel

In general, steel expands as it is being heated—but not always. Through a part of the temperature range it contracts. If heated too rapidly, this may result in cracking, as the inside of the piece may still be expanding after the outside has started to contract. The above chart shows this characteristic for a representative grade of steel.

Which quenching medium for best results?

The hardness developed by quenching, as well as distortion and residual stresses, depends to a great extent on the cooling rate of the quenching medium. It is important that the medium be selected with an eye to the nature of the steel.

These photographs show the reaction at the start of the quench in water, brine and oil, and reveal important facts about the action of these quenching media on heated steel. Made by a method of high-speed photography developed by Professors Edgerton and Germeshausen at the Massachusetts Institute of Technology, the pictures are reproduced by permission of the maker, Professor I. N. Zavarine, Department of Mining and Metallurgy, Massachusetts Institute of Technology, and of "Metal Progress," published by the American Society for Metals.

Start of quench in water

Start of quench in brine

Start of quench in oil

AT THE METAL SHOW

Bethlehem presents "The Heat Treatment of Steel"

Bethlehem's exhibit at the National Metal Show features heat treatment, covering the subject from the old-time determination of drawing temperature by color to the operation of a thoroughly modern, automatically controlled electric heat-treating plant.

A salient feature of the exhibit is a series of illustrated talks on the treatment of six different types of steel—carbon, manganese, molybdenum, nickel, nickel-chromium and spring steels. Physical properties charts, photomicrographs and fractures are shown for four different analyses of each of these types, and factors to be considered in treatment are discussed.

A working model of Bethlehem's all-electric bar heat-treating plant is also exhibited.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY

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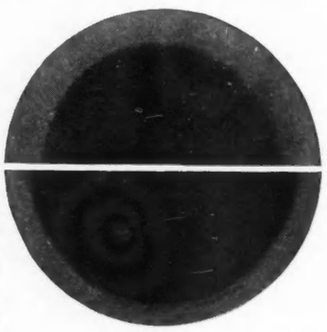

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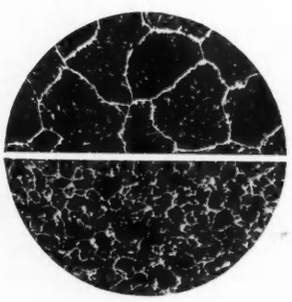
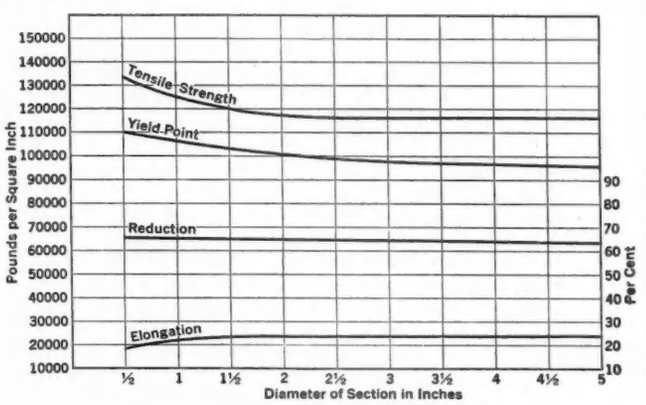


Coarse-grain steels harden deeper, machine more readily. Fine-grain steels will machine to a better surface, are distorted less in heat treatment, stand shock better. For best results in any application it is necessary to strike a balance between these factors.

What is the effect of size of parts?



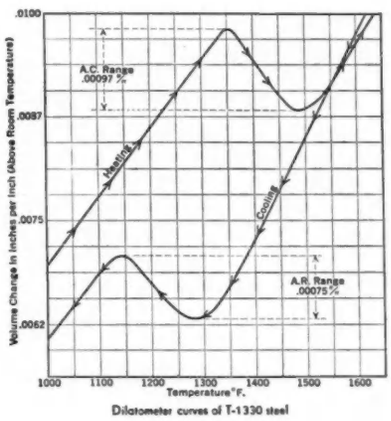
S. A. E. 3240, oil quenched at 1500° F., drawn at 1200° F.

As parts increase in size heat treating becomes more complex, on account of decreased effectiveness of the cooling medium and the development of internal stresses. The size of the part will to some extent influence the selection of steel, as well as the details of the heating and quenching. Also, as size increases, greater care must be exercised in handling the steel.

What about handling during quenching?

Even such an apparently trivial detail as immersion in the quenching medium must be handled with consideration of many factors. For example, if gas bubbles are permitted to cling to the surface, uneven quenching may result. The exact method of handling will depend on the shape of the piece.

Where is the danger in heating?



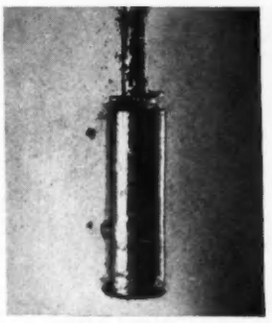
Dilatometer curves of T-1330 steel

In general, steel expands as it is being heated—but not always. Through a part of the temperature range it contracts. If heated too rapidly, this may result in cracking, as the inside of the piece may still be expanding after the outside has started to contract. The above chart shows this characteristic for a representative grade of steel.

Which quenching medium for best results?

The hardness developed by quenching, as well as distortion and residual stresses, depends to a great extent on the cooling rate of the quenching medium. It is important that the medium be selected with an eye to the nature of the steel.

These photographs show the reaction at the start of the quench in water, brine and oil, and reveal important facts about the action of these quenching media on heated steel. Made by a method of high-speed photography developed by Professors Edgerton and Germeshausen at the Massachusetts Institute of Technology, the pictures are reproduced by permission of the maker, Professor I. N. Zavarine, Department of Mining and Metallurgy, Massachusetts Institute of Technology, and of "Metal Progress," published by the American Society for Metals.



Start of quench in water

Start of quench in brine

Start of quench in oil

AT THE METAL SHOW

Bethlehem presents "The Heat Treatment of Steel"

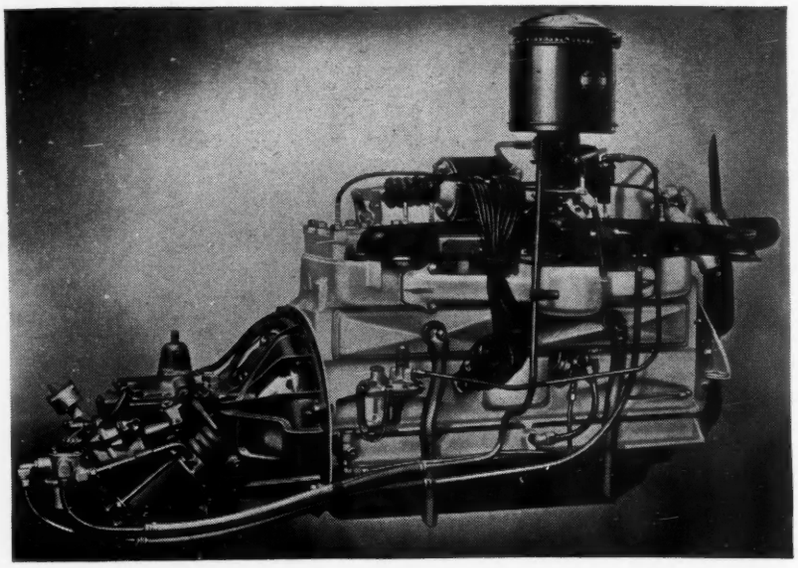
Bethlehem's exhibit at the National Metal Show features heat treatment, covering the subject from the old-time determination of drawing temperature by color to the operation of a thoroughly modern, automatically controlled electric heat-treating plant.

A salient feature of the exhibit is a series of illustrated talks on the treatment of six different types of steel—carbon, manganese, molybdenum, nickel, nickel-chromium and spring steels. Physical properties charts, photomicrographs and fractures are shown for four different analyses of each of these types, and factors to be considered in treatment are discussed.

A working model of Bethlehem's all-electric bar heat-treating plant is also exhibited.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY



Hudson 8-cylinder engine for 1938 which develops 122 hp. at 4200 r.p.m. Note the wiring arranged in harness form.

vibration and drumming within the body.

Changes made in the design of the ignition coil permit of satisfactory operation with a wider spark-plug gap, and it is now unnecessary to adjust or replace the plug until the gap width has become 0.040 in. Better provisions are made to guard the ignition distributor against splashing mud and water, by means of additional guards over the torque-arm bracket and over the hole in the right side rail of the frame through which the steering shaft passes in cars with right-hand drive.

All wiring on Hudson cars is now arranged in harness form, which not only improves their appearance but also gives better assurance of proper connections. On the Hudson Six and Hudson Terraplane models a straight-through type of muffler has been adopted. This has permitted of doing away with the heat baffle formerly used between muffler and body floor, and at the same time has reduced the under-floor temperature. The water pump now has a seal composed of synthetic rubber and cork. On the eight-cylinder model the cooling capacity has been increased by improvements in the design of the radiator core and an increase in the frontal area.

The clutches of all models have been enlarged and have additional springs. Formerly there were nine springs on the clutch of the Six and 12 on the clutch of the Eight. Now there are three additional springs on each model, these being nested in three of the regular springs. Torsion-damper springs on all clutches have been made stiffer, and the clutch discs are now cupped.

Greater rigidity has been provided in the transmission by making the housing heavier, ribbing it at the bearing supports, and providing the shafts with involute instead of the former straight-sided splines. The lock ring on the second-speed main-shaft cup gear has been made heavier, and additional space is provided for deposits at the bottom of the transmission housings. A larger filler opening facilitates servicing.

On long-wheelbase models a 3½-in. propeller shaft is used, while other models retain the 3-in. shaft of last year. This assures that on all models the critical speeds of whirling are above the top speeds of the cars. The hill-hold, a device acting in conjunction with the hydraulic braking system to hold a car from running backward on an up-grade, is continued as an option.

To permit of the use of oversize tires without interference, the rear tread has been increased 1½ in. on all models, and the rear-axle design has been adapted to this increased tread.

The Hudson "radial safety control" is continued, with a stronger forged-steel torque arm and new synthetic rubber-and-cork oil seals on the spindles of the torque arm. The front-end stabilizer has been improved by increasing the length of its arms. This, however, does not apply to business models.

Wheel rims have been brought ¼ in. closer to the mounting flange, to reduce the overhang of the wheels and the consequent stresses on rear-axle shafts and front-wheel spindles. Hudson models, both the Six and the Eight, carry a new type of disc wheel with a concentric design on the wheel disc. The tire size is 16-6.00, except on the Hudson Eight, which has 16-6.26 tires. The roller-tooth steering gear, adopted last year, is continued, with a ratio of 18.2. On the Hudson Terraplane model the section of the drag link has been increased, and a change made to a steel of higher carbon content, to increase the stiffness of this member.

The electrical system has been revised to increase its safe output. The generator has third-brush control, modified to maintain a constant output at high speeds. An output of 25 amperes is available at all speeds. The size of the generator cooling fan has been increased. Voltage regulation is provided for on all except the Hudson Terraplane and the business models, on which it is optional at extra cost. Location of the battery in a ventilated compartment of the cowl, under the hood, which was introduced by Hudson last year, is continued. Records are said to show that in this location the frequency of need for water additions is greatly reduced.

For 1938 Hudson offers two radio installations as optional equipment, at different price levels, both being fitted between the instrument panel and the dash, control heads and speaker being integral with the receiver. The 7-tube Custom set has continuously-variable tone control, an 8-in. speaker attached to the lower side of the case, beam power tubes, an antenna circuit designed for operation with either body or running-board antenna, and an automatic sensitivity control, developed by the Hudson engineering department, which permits of satisfactory reception from nearby powerful stations and from more remote stations with relatively weak signal strength.

The 6-tube set has a 6-in. speaker and antenna connections for both roof and running-board antenna.

In the bodies, the new position of the instrument panel moves the front seat closer to the windshield, thereby improving the vision. Entirely new instrument panels are used. On the Hudsons the lay-out of the instruments is balanced, there being a large speedometer dial directly in front of the driver at the left, with the clock (when used) in a corresponding position on the right. In the center of four symmetrically-arranged circles are the gasoline gage, temperature indicator, ammeter tell-tale light, and oil-pressure tell-tale light. On the Hudson Terraplane the same balanced lay-out is used for the speedometer and clock, but the other dials are in a rectangular strip with individual oblong dials in a row across the center of the instrument panel. At the middle of the panel is the radio dial.